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ILLUSTRATIONS.

Clement's Inn Chambers.—Mr. F. Hemings, Architect ..... *Single-Page Ink-Photo.*
Statue of Shakspeare, Paris.—M. Paul Fournier, Sculptor ..... *Single-Page Ink-Photo.*
Wollaton Hall from the North-West.—From a Sketch by Mr. J. Johnson ..... *Single-Page Ink-Photo.*
Tower, Youlgreave Church, Derbyshire.—From a Sketch by Mr. J. Johnson ..... *Single-Page Ink-Photo.*
Stonefold Church, Lancashire.—Mr. Basil Champneys, Architect ..... *Two Single-Page Photo-Litho's.*
Design for a London Street Front.—By Mr. C. E. Mallows ..... *Double-Page Ink-Photo.*

Blocks in Text.

Studies by Du Cerceau: Portion of a Château, and Principal Entrance of the Louvre ..... *Page* 171
Sketches Illustrative of Architectural Association Excursion 176–7
North Aisle of Retro-Choir, Peterborough Cathedral.—Sketched by Mr. F. D. Bedford 178

CONTENTS.

Du Cerceau 169
Notes 172
Norwich Castle and a Public Museum 173
The British Archæological Association at Glasgow 173
Sketches Illustrative of the "A. A." Excursion 176
Sketch in Peterborough Cathedral 178
Clement's Inn Chambers 178
Statue of Shakspeare for Paris 178
Wollaton Hall 178
Tower of Youlgreave Church, Derbyshire 178
Stonefold Church 178
Design for a London Street-front 178
The Metropolitan Board of Works Inquiry Commission: Further Evidence 179
New Public Works in Carlisle 180
Wooden Structures and the Building Act: Erections at "Olympia"; The Switchback Railway at the Crystal Palace 182
Action Against a Local Board 182
The Wallace Statue, Aberdeen 182
Ancient Inscription at Kendal 183
Arches, Nave Triforium, Beverley Minster 183
The Basset Motto 183
Proposed Public Library, &c., Newton Heath 183
'Cement Finishing for Painting" 183
Flooring 183
Chimney-pots 183
The Student's Column: Artificial Stones.—X. 183
Recent Patents 184
Recent Sales of Property 184
Miscellanea 184
Sale of Building Sites at Lowestoft 184
New Railway and Station Works at Greenwich 185
Prices Current 185

Du Cerceau.

THE latest of the series of special studies on architectural subjects to which Baron de Geymüller is devoting himself, and which will be among the most valuable contributions to architectural literature of this generation, is a volume on the life and works of "Les Du Cerceau," as the author entitles his work,* for it deals to some extent with the work of the son and other members of the family of Jacques Androuet du Cerceau, with whom personally, however, the book is mostly concerned—as, in fact, the reputation connected with the name is almost entirely due to him.

To most of us this reputation is rather a vague one, the name of Du Cerceau being kept before us mainly by the frequent references in works on architecture to his principal production, "Les plus excellents Bastiments de France" (we love to give the old spelling), as a valuable mine of information on the French château architecture of the sixteenth century. It is, in fact, this vague nature of the Du Cerceau reputation which has partly suggested the special study of the subject by the author of the work before us. He observes that, while the name of Du Cerceau has long been familiar to every one in connexion with French Renaissance architecture, while he is regarded as one of the most celebrated architects of the French Renaissance, and his statue shares with that of Jean Goujon the place of honour in the new Louvre, yet there is hardly any one in French artistic history about whom there is so little real knowledge and so much misapprehension. In a quotation from Berty's work, "Les Grands Architectes Français de la Renaissance" (1860), it is remarked that the name of Du Cerceau is mostly regarded merely as that of the author of "Les plus excellents Bastiments," and that he, who was born somewhere about 1515, is credited with having built the Pont Neuf, the Hôtel de Bellegarde, and even that of Bretonvilliers, which would have given him a life of a century and a half's duration. On the other hand, Berty doubts whether Androuet du Cerceau was properly an architect at all; and another French critic, M. Destailleur, suggests that it was his books in illustration of architecture which procured for him the complimentary title of "Architecte du roi," and that we have no proof of any building having been actually constructed under the direction of Jacques Androuet du Cerceau. Baron de Geymüller thinks that, considering the terms in which Jacques Androuet is frequently referred to, we can hardly avoid the conclusion that he was a practical architect, and employed as such. Baptiste du Cerceau, for instance, is spoken of by a contemporary as a young man, "fils de Du Cerceau, bourgeois de Montargis, lequel a esté des plus grands architectes de nostre France," an expression which would hardly be applied to any one merely on the strength of some illustrative architectural publications, however able and valuable. Where, however, are the buildings erected by Du Cerceau? It is partly towards finding an answer to this question that Baron de Geymüller's study has been directed.

The author's conclusions, as in his previous works, are mostly based on documents and drawings hitherto unpublished, and among these were a set of architectural sketches in the Bibliothèque Royale at Munich, to which Baron de Geymüller's attention was drawn by a letter from the Munich Librarian in 1884, who wished to know if the French savant could throw any light on their authorship. These drawings consisted mainly of elevations of parts of buildings executed in Rome from the designs of Bramante, Raphael, and Sangallo. The character of much of the detail drawing in these sketches left no doubt in the mind of the author and of M. Destailleur that they were the work of Du Cerceau; a fact which, if accepted, would indicate that he had visited Italy for the serious study of Renaissance architecture in that country,—a course which would be likely to be pursued by a French architect of that day who was desirous to become a proficient in the designing of buildings in the new style in his own country. The probability that Du Cerceau went to Italy to study is in itself of some interest, as an additional instance of the influence of Italy on the architecture of the period in the rest of Europe: a subject in regard to which M. de Geymüller has some general remarks to make in his preface. Glancing at the modern opinion, which he refers to as prevalent in France, Belgium, and Holland, as to the injurious effect of the Renaissance on the spirit of modern architecture, and admitting that the architecture of France in the period before the Italian influence took possession of her was marked by a purer style, especially of detail, he adds that nevertheless "we are convinced that the introduction of the forms, and to some extent of the principles, of Italian art could alone have supplied the necessary elements for a new development in Gallo-Germanic countries;" that this introduction was in the main salutary and indispensable; and that in France, at least, it must have appealed to a hereditary Latin sentiment already existing. This argument, introduced by the author by way of justification of the part played by Du Cerceau in the architecture of his day, we may cite as another indication of that reinstatement of the Renaissance towards which English critics and architects have also shown such a tendency of late, and which, in fact, is only a natural reaction against the exaggerated disparagement of the Renaissance which has been prevalent among us during the last quarter of a century.

The other documents upon which Baron de Geymüller has founded his "Étude" are chiefly those in the possession of two architects, M. Destailleur and M. Lesoufaché, and of an amateur collector, M. Foulc; who, among them, possess the most complete collection attainable of drawings and engravings by Du Cerceau. This name, as most of our readers are aware, is but an appendage to the real name of the architect, though it seems to have become practically adopted as a surname by his family. He was Jacques Androuet, "of the circle"—"surnommé du Cerceau, qui est à dire Cercle, lequel nom il a retenu pour avoir un cerceau pendu à sa maison, pour la remarquer, et y servir d'enseigne;" and in a list of the pensionnaires of Henri III., the names of himself and Baptiste, his son (probably), are given as "Jacques Androuet dict Cerceau," and "Baptiste Androuet dict Cerceau." The name, in fact, is like those characteristic epithets which, applied half playfully to many of the painters of the early Renaissance, clung to them and practically extinguished their true family names. The date of Androuet's birth, at Paris, the author is disposed to place a little earlier than the 1515 usually accepted; he would place it at not later than 1512, partly on the ground of the apparent date of some of the Italian

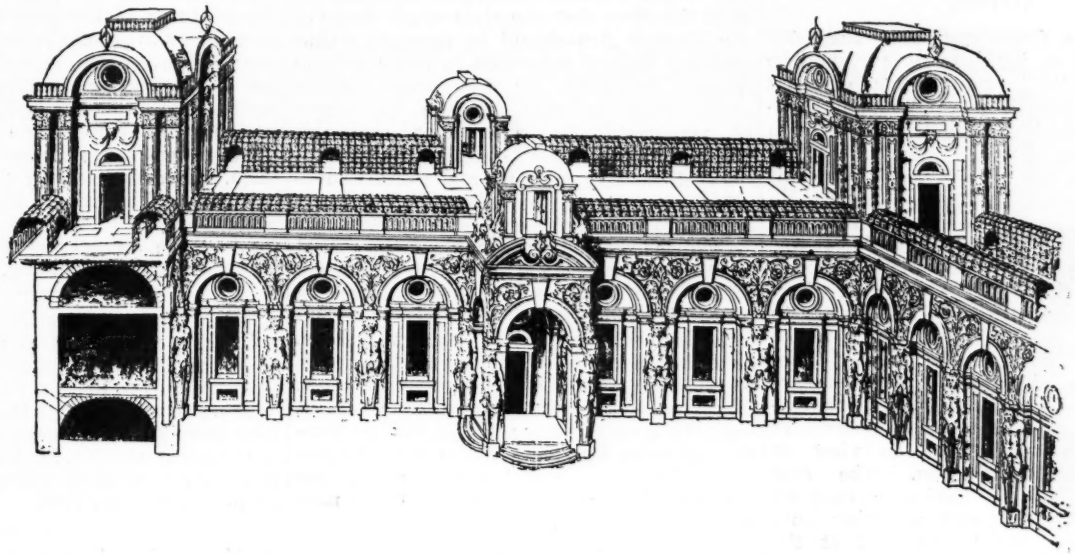
* Les Du Cerceau; leur vie et leur œuvre: d'Après de Nouvelles Recherches. Par le Baron Henry de Geymüller, Architecte, &c., &c. Paris: Jules Rouam; London: Gilbert Wood & Co. 1887.

sketches now attributed to Androuet du Cerceau.

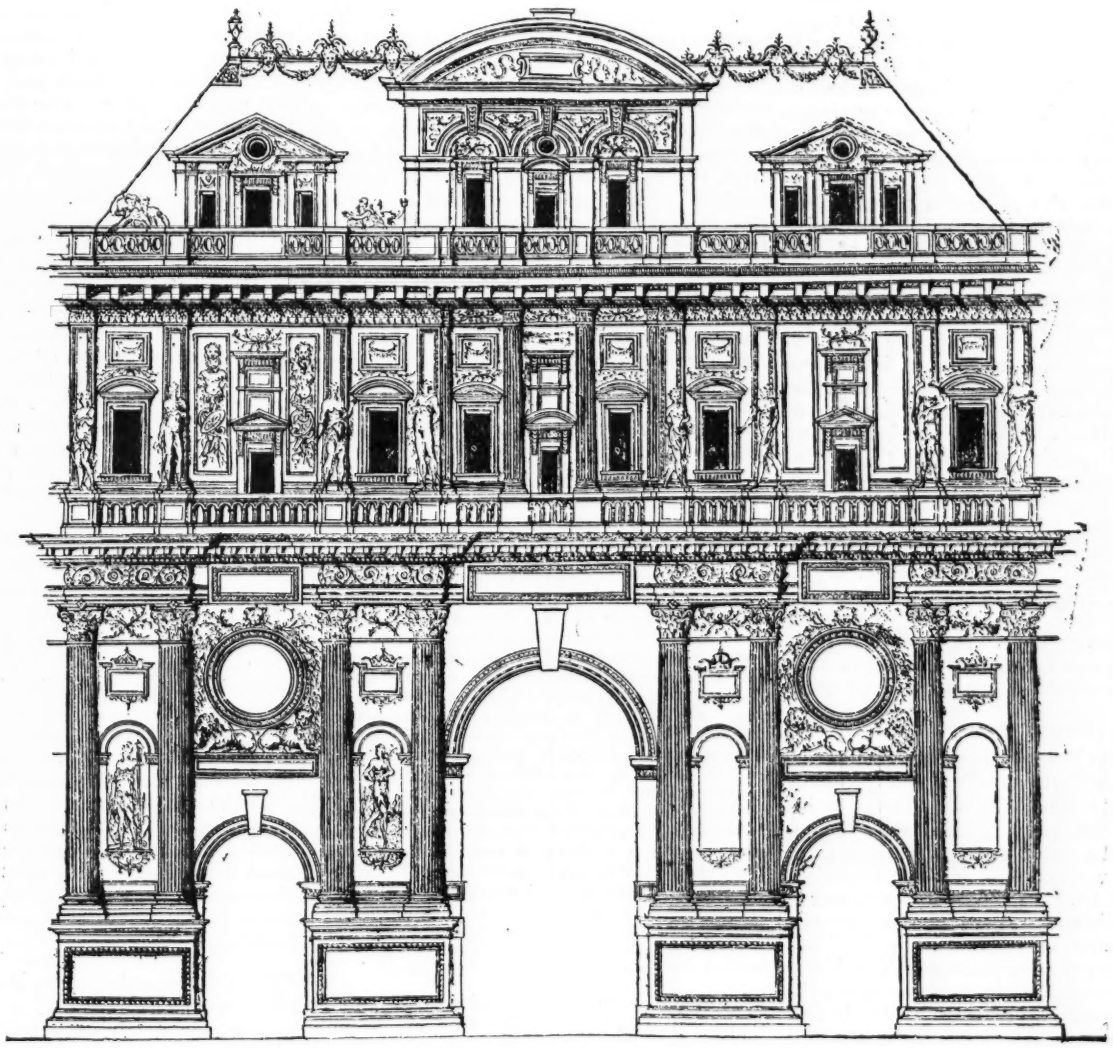
Apart from the special evidence as to the probability of Du Cerceau having been actually the working architect, so to speak, for some special buildings, the author puts the question in his chapter vi. "Jacques Androuet du Cerceau etait-il architecte?" in regard firstly to the large number of admitted and published designs by him, and the sketches for various designs, many of which are now published in this work for the first time. The "Plus Excellents Bastiments" we must pass by for the moment, because the question whether he was himself the designer of one or more of these is one of the points in debate. The most connected evidence of Du Cerceau's powers and tastes as an architectural designer, among his published works, is his book giving the plans and designs for "Cinquante Bastiments, tous differens," which is, in reality, a series of plans of ideal châteaux. These show a great variety of invention in regard to plan in one sense; that is to say, there are a number of schemes for palaces based on various symmetrical plans, and with designs erected on these plans, which exhibit a considerable amount of effectiveness in a formal and academical manner. We have a plan consisting of a quadrangle with angle pavilions projecting at an angle of 45°, with a colonnade round the courtyard; another with large square pavilions at the corners of a diamond-shaped court, the pavilions connected by narrow galleries; or we have a decagon courtyard with pavilions on five of its external sides, and narrow galleries connecting them. Baron de Geymüller gives two other still more odd examples of ideal châteaux of the same kind, one, a château consisting of a circular centre pavilion, with two galleries in concentric rings around it connected by bridges at the four points of the compass; another, a great courtyard, making a quatrefoil on plan, enclosed by four masses of building, each forming a half-circle, with oblong pavilions at their outer circumference, and round towers at the re-entering angles. These two are compared by our author with two rough sketches of designs for ideal towns, described as "Sketches by Fra Giocondo after an unknown Italian architect"; these are from M. Destailleur's collection, and each show the main idea of a circular centre temple, with streets radiating from it to the circumference of the walls. Both of these look very much as if they, or such other sketches from similar (Italian) sources, had set Du Cerceau's fancy in motion; and in one of them the outer wall shows round towers with small pavilions above, which have a remarkable resemblance to Du Cerceau's round towers in the "quatrefoil" ideal château above-named. These designs of Du Cerceau's show a considerable amount of fancy, and a power of laying out a plan effectively on a geometrical basis; but it may be doubted whether in themselves they could be accepted as proof that their author was a practical architect. Fanciful and varied as they are, they are mostly exceedingly unpractical; they are plans of which it would be difficult to make any convenient use, at all events at all comparable with the cost of building them. Baron de Geymüller seems to have misgivings of this kind himself, as he remarks that one must not suppose that Du Cerceau dreamed of executing these works, any more than Leonardo da Vinci thought of carrying out some of the singular combinations shown in his treatise on domes, "L'un et l'autre poursuivaient le même but, nettement defini; approfondir les lois de la composition et se rendre compte des éléments qui produisent le plus effect et de l'ordre dans lequel il faut les grouper pour atteindre ce résultat." We should have thought Da Vinci would have been just the man to have carried out his dome schemes in actual building if he could have got the chance; and Du Cerceau's preface to the "Cinquante Bastiments" is in quite a serious and business-like vein. The designs do exhibit a power of architectural grouping, but of a kind that would be more likely to occur to an architectural draughtsman and book-maker than to one whose chief concern had been with actual buildings. Baron de Geymüller calls attention to another peculiarity in Du Cerceau's drawings which is more to the point. This is his habit of illustrating any one of the orders, not by a typical column and capital of the orthodox type, but by three variations of his own devising: often in bizarre and questionable taste, but still exhibiting originality and a habit of bringing his own thought to the consideration of classic forms of design, which is certainly characteristic of an architect and not of an amateur.

All this, however, still leaves one with the conviction that it would be more to the purpose of the argument to discover good evidence of Du Cerceau having been actually employed as architect upon some known buildings of importance; and to this part of the question Baron de Geymüller next addresses himself. One building, it appears, and one only, has been habitually and specially attributed to Du Cerceau by various writers at various times: the choir of the Church of the Madeleine, at Montargis. The author quotes on this head from the historian Guillaume Morin, who lived a generation or so after Du Cerceau:—"Du temps de Mme. d'Este, duchesse de Ferrare, les habitants et bourgeois de Montargis se cottisèrent pour faire bastir le chœur d'icelle (église) en la forme qu'il se void à présent. Le dessein en fut projetté par Du Serseau, l'un des plus ingénieux et excellens architectes de son temps. Le commencement fut sous le règne de Henry Second, et fut parachevé l'an 1608." This seems pretty clear, though according to M. Berty, the author before quoted, the result does little for Du Cerceau's fame, and he calls it a "triste edifice." Other critics, with whom Baron de Geymüller sides, consider it a building of a good deal of interest. The sketches which he gives, taken on the occasion of a visit to study this admitted work of Du Cerceau's, appear to us to confirm both criticisms. The building is "triste," but is at the same time original, and certainly the work of a man who had "notions" of his own, in which respect it tallies with the evidence of the "Cinquante Bastiments." It appears from the sketch to have been a late Gothic building, with an octagon apsidal end above, rising out of a square-ended ground story with the corners rounded off,—the line of the square termination being carried up above by flying buttresses at right angles to each other, abutting against an angle buttress decorated with Classical pilasters, and an urn in the place of a pinnacle; behind this arrangement the oblique face of the octagonal clearstory, with a large traceried window, is seen. The pilastered buttresses and urns, with quarter-circle flying buttresses, are continued in perspective along the aisle roof; the windows are all Gothic, the buttresses and pilasters all Classic. The effect of the whole is odd in the extreme, but it is a kind of thing no architect would pass without an inclination to sketch it, for its very peculiarity; and if, as appears, there is documentary evidence of the author of "Cinquante Bastiments" having had a hand in it, the building certainly bears out the documents. The near neighbourhood of Montargis to Orleans suggested to the author to prospect among the street buildings of the latter town for traces of the hand of Du Cerceau, and he gives a house-front which might very well have been by him; but it appears to be pure conjecture. For two other more important buildings, however, there seems to be something more than conjecture. These are the Châteaux of Verneuil and Charleval, both illustrated in the "Plus Excellents Bastiments," though without any claim being there made by Du Cerceau as to having designed or superintended them.

The evidence as given by Baron de Geymüller is curious and interesting, and the traces of it have been followed up and put together with much care. In the first place, we have to note that Du Cerceau gives to Verneuil ten plates and ten chapters in his work, which is more than he gives to the Royal Palaces of the Louvre and Madrid. The drawings are executed with unusual care; in one elevation even the ornaments of a range of windows which are nearly hidden by a balustrade are carefully drawn as seen through the openings between the balusters: as if the author knew and valued every detail in the work. Yet Du Cerceau remarks on this that "le Desseing avoit été arresté pour la face de la terrace qui eust été devant le logis neuf"; so that this portion, thus carefully drawn, was never in execution: how did Du Cerceau come to illustrate it so lovingly if he were merely illustrating another architect's building? And is it not rather probable that he was putting on record, as completely as possible, what he had himself designed and never carried out? The style of Verneuil differs a good deal from that of most others of the "Plus Excellents Bastiments," and especially the design includes the same kind of fantastic seated figures, half human, half animal, with an odd kind of butterfly-looking wings, which form a favourite ornament in the acknowledged designs by Du Cerceau. The use, at Verneuil and Charleval, of rusticated masonry in great profusion, is also a characteristic of Du Cerceau's known designs. But there is further circumstantial evidence in regard to the architectural treatment of Verneuil in the history given of it by Du Cerceau himself. This history shows that when Du Cerceau published his very elaborate drawings of the château, it was not completed, nor even the exact manner of its completion determined on. Du Cerceau speaks clearly of two stages in the construction of the mansion, under two different proprietors. He speaks of the intentions of the first proprietor, M. Boulainvilliers, who commenced the mansion; then he mentions it passing into the hands of the Duc de Némours, who did not find it entirely to his liking, and had made "au lieu de deux petits pavillons entarmes à chacune encoigneure du bastiment par le dehors, un grand pavillon qui sont quatre pour tout l'edifice." The meaning of which latter expression seems rather obscure, but what follows is plain enough; "Mais pour plus esclarter l'œuvre, *son intention* est de dresser sur le devant, vers le val, une salle de trente toises de long sur cinq de large, et une chambre à chaque costé, revenantes à la largeur de la salle, le tout couvert en terrace," &c. It is here evident that the work was not finished, and that Du Cerceau was perfectly *au fait* as to what was going to be done; and M. Destailleurs possesses a beautifully-finished drawing by Du Cerceau showing the château with the front face lower than the other sides of the quadrangle (of this the author gives a small reproduction), and which differs in detail from the drawing given in the "Plus Excellents Bastiments"; and there is another sketch by Du Cerceau, which we reproduce here, a "study for portion of a château," which is apparently a study for that same side of the quadrangle at Verneuil, "tout couvert en terrace," and with the larger angle pavilions nearly similar to those shown in the illustrations of Verneuil. And to all this Baron de Geymüller adds the words used by Du Cerceau in regard to the Duc de Némours, in the preface to the "Edifices Antiques Romains," in dedicating the book to his patron: "Aussi que de longtemps vous m'avez fait cet honneur que de m'accepter pour vostre et m'entretenir par vostre libéralité, qui me fait estimer vostre ce que provient de moy. Partant avec toute humilité ie le vous offre et présente, vous suppliant le recevoir de mesme œil et faveur qu'avez par cy devant fait quelques autres miennes petites inventions." The phrase "petites inventions" might indeed be taken to refer to his former drawings; but when we take the whole passage in conjunction with the facts beforementioned as to the manner in which Verneuil was illustrated before its completion, and Du Cerceau's intimate knowledge of what was intended to be done, the consensus of evidence seems to establish, with at least the highest probability, that he was the Duc de Némours' architect for the château, and did practise as an architect; the only matter for surprise being that he should have made no



Study for Portion of a Château.—By Du Cerceau.



Study for the Principal Entrance of the Louvre.—By Du Cerceau.

claim to his own work in his book illustrating the châteaux of France.

Baron de Geymüller classes the great number of original drawings by Du Cerceau which are in existence under three periods; the first, as the drawings are illustrated in this book, showing a rather bald manner of outline drawing; the second, a much more finished and formal architectural manner, with a great deal more detail put in; the third, a more free and sketchy manner, with a greater liking for perspective drawing rather than elevation, and a certain amount of effect aimed at by shading in line in the shadowed parts. Both the drawings of which we give impressions (by permission of the author and publisher) belong to this second period; the project for an entry to the Louvre we give as one of the best and (we might add) most rational examples in the book, of Du Cerceau's method of dealing with Classic materials in a composition. For, in regard to a great many of Du Cerceau's designs, there can be no question that his taste in detail was often detestable; the drawings of what is called by the author his "third manner" are especially flagrant in this respect; they are covered with gimcracks, festoons twisting every way, immense consoles out of scale with the main design, &c. But with all this there is about his sketches a distinct force and originality of conception which places them, with all their offences against pure taste, quite out of the category of the commonplace.

We have merely dealt with a portion of Baron de Geymüller's book, confining ourselves mainly to one special point which he desires to establish—that Du Cerceau was really a practical architect and designer and superintendent of buildings, and not a mere illustrator; but we have done no more than hint at the amount of curious and interesting information to be found in the book, both in the text and in the numerous hitherto-unpublished drawings of the Renaissance period by Du Cerceau and others, of which fac-similes are given, and which throw such an interesting light on the spirit in which Classic forms of architecture were regarded and made use of, and on the characteristic methods of architectural drawing and representation among the Renaissance architects of the sixteenth century.

The British Association commenced its annual meeting at Bath on Wednesday, when Sir Fredk. Bramwell delivered the opening address.

NOTES.

IT has frequently been suggested that an immense saving would be effected in the working expenses of our railways by the adoption of the American bogie-truck system in the construction of goods wagons. Rather over two years ago we remarked upon this (see p. 364, March 6, 1886), Mr. Jefferds, C.E., having drawn attention to the question in a contemporary. We then observed that it was quite refreshing to have for consideration a practical proposition in the direction of reform, and it is now still more satisfactory to find that the reform itself seems to be commencing. The Midland Railway Company—who are always to the front—are having some bogie-truck cars constructed, and last week several specimens of the new rolling-stock were on view at St. Pancras Goods Station. The coal truck is described as having a carrying capacity of 30 tons, and weighing only 10 tons, whereas the trucks used at the present time weigh 5 tons, and carry only 8 tons. It will be readily seen that there is an enormous difference in the proportion of dead weight to paying weight in the two types. The length of the new wagon is 33 ft., and it runs upon two bogie trucks of four wheels each,—the principle being similar to that of the newer types of long passenger carriages. The freight car, constructed on the same principle, only weighs 8 tons, and is capable of carrying 30 tons. A great point to be considered, besides the reduction in the dead weight, is the reduced amount of locomotive power necessary to haul vehicles of this description, as they are less rigid than our ordinary wagons, and traverse curves with less resistance. Mr. Roberts, of the Carriage and Wagon Department of the Midland Railway, has given a number of interesting comparisons between the two systems in the *Railway Herald*, the following being one of the most striking. The Midland Company owns 85,171 goods wagons, with a total carrying capacity of 681,368 tons. These wagons, if coupled up buffer to buffer, would make one single train 290 miles 626 yards in length. A train of American wagons, carrying the same quantity of goods, would only be 141 miles 1,672 yards long. Mr. Roberts sums up by advocating the renewal of all worn-out stock on the American principle, having come to the conclusion that such a course would be productive of great economy.

A CURIOUS use of the word "pediment" occurs in Carlyle's "Past and Present," chap. xvi. He is usually very happy in his etymologies—fantastic though they sometimes be—and a novel use of a familiar word by so great a word-master is worth attention. The shrine of St. Edmund, it appears, rested upon the High Altar, which was by the "careless candle of somnolent monks" destroyed, or, at any rate, damaged. The Abbot forthwith re-edified it to serve as a "pediment" for the shrine. Carlyle evidently had *pes, pedis* in mind. Skeat is a little troubled about the etymology of this word, and although he gives as its meaning, "an ornament finishing the front of a building," deduces it from the Latin *pedamentum*, a stake or prop with which vines are supported. If this be the true root, a pediment is not the "triangular thing" of Mr. Ruskin's (another great word-master's) scorn; but the row of supporting columns. Pediments over windows, doors, &c., as usually understood, are miscalled, and we want a word for a Classic gable of low pitch.

THE Trades' Union Congress, which is being held at Bradford this week, appears so far to strongly resemble the congresses of the last year or two in the infusion of a strong political element in the discussions which have taken place. Mr. Shaftoe, the President, after glancing at recent disclosures which have been made as to what is called the "sweating system," said that something like a general agreement had been arrived at to the effect that the sixty-ninth clause of the Factory Act should be repealed, "thus enabling factory inspectors to enter private houses, bedrooms, or any place where goods were believed to be in course of manufacture." He thought that this would "enormously check" the sweating system. He took up and warmly advocated a suggestion which he said had lately been thrown out by our contemporary, the *Lancet*, to the effect that municipalities should erect special workshops for such trades as are affected by the sweating system, whereby proper light, ventilation, and sanitary accommodation could be secured. Such workshops, he argued, could be let at a fair rent, and their establishment would entail no pecuniary loss. Of course we are quite in sympathy with this suggestion, on sanitary grounds, but its practical adoption by public bodies must be preceded by very careful consideration, for reasons which are so obvious that we need not state them here.

MR. EDWIN CHADWICK'S address to the Brighton meeting of the Association of Public Sanitary Inspectors, of which mention was made in our last, did not contain much that is new to those who are familiar with his speeches and writings. Referring to the high rate of mortality in Manchester, he applied his old thesis to the cotton metropolis by saying that "a contractor, with enlarged and commensurate powers, might contract for the reduction of the excessive death-rate of Manchester,—now 27,—to 16 per thousand." And this reduction, he averred, would be attended, as at Leek, "with an augmentation of five years of the average duration of life and working ability." Of the chief aspects of the new Local Government Act Mr. Chadwick promises to speak on a future occasion. But he briefly adverted to some of the most hopeful of the chief provisions of the new Act. We quote one passage:—

> "The enlargement promised of many of the areas of local administration, with some securities for sanitary qualification, offers new opportunities which may conduce to improve local organisations. If due exertions be made to inform the electors of their paramount interests in our work, they may be led to make a new and clear start, rejecting the sordid owners of bad tenements; those who go in solely for contracts among persons whose interests are adverse to a correct administration; and those who continue the enormous wastefulness of ignorance. If it be duly impressed on the wage classes that a large proportion of the £24,000,000 which they pay annually for insurance charges against excessive sickness and mortality may be saved by the efficient administration of sanitary science, we may expect larger additions to our demonstrations of the power of those classes. But it must be admitted that, despite the flagrant examples of the working of vestralization, in the hurry of legislation large opportunities have been left for its continuance of the error. Before the close of the session, however, opportunities may be afforded for correction; that is, if the promises made of a due recognition of our science, and of the position due to them, be not longer withheld."

We are afraid that Mr. Chadwick is a little too sanguine in anticipating that much more will be done this session in the way of sanitary legislation.

THERE are no places more liable to outbreaks of diseases arising from insufficient and imperfect sanitary arrangements than new watering-places. Nowhere has the increase in houses for summer visitors at the sea-side been more rapid in the last few years than in the Isle of Man. Houses have multiplied quickly, not only in Douglas, which is now largely a town of lodging-houses, but also in Ramsay, Port Erin, and Port St. Mary. In the last-named place we are informed that diphtheria has broken out through defective sanitary arrangements. It is not in the least astonishing that in these new watering-places in the Isle of Man and elsewhere such diseases should arise. In the first place, persons who build the houses are frequently quite ignorant of ordinary sanitary arrangements, or are careless about them; and in the next, as many of these seaside lodging-houses are practically unused for three-fourths of the year, they are more apt than others to become insanitary through disuse; moreover, the lower class of visitors are not those who are careful about sanitary matters. As the Isle of Man swarms in the summer with visitors from the factories and the counting-houses of Lancashire and Yorkshire, it is most necessary that the authorities in that healthy island should take careful precautions not to allow a place unsurpassed for its pure air and fine sea to be spoilt by hasty and careless building.

SOME further alterations are in course of being carried out at the north-western corner of St. Paul's Churchyard. The demolition extends to the St. Paul's Hotel (lately Watson's), which covers the western entrance here into London House-yard; No. 78, Todd & Procter's; and No. 79, Verinder's, the long-familiar cutlery shop, which latter was established in the year 1766.

BY direction of Sir Wyndham Knatchbull, Bart., some properties and rich grazing lands in East Kent will be offered for sale by auction on the 25th instant, at Ashford. The pastures, lying in the Romney and Walland Marshes, cover 1,074 acres in all, situated in the parishes of Brookland, Ivychurch, Midley, and Bilsington. The other properties, to the extent of 1,150 acres, are portions of the outlying Mersham Hatch estate, round about Sevington, Willesborough, and Summer Hill, to the south-east of Ashford, by the main road to Hythe and Folkestone. The Knatchbulls have owned the manor of Mersham-le-Hatch since 2nd Henry II., when Richard Knatchbull bought it of the executors of one Edwards. In the ancient church of St. John-the-Baptist are preserved several memorials of his house. These comprise brasses of 1582 and 1584, the monument to Sir Norton Knatchbull, who was created baronet on August 4, 1641, and represented the county in parliament; he died 1684. Also of his eldest son, Sir John (1696), Sir Norton (1636), sheriff of the county in 5th James I., and Bridget (1625), one of his three wives. The church was restored in 1877 by Sir Wyndham and the Rev. R. B. Knatchbull-Hugessen, vicar.

THE Earl of Crawford and Balcarres has made the munificent gift to the nation of the equipment of his observatory at Dunecht, to be placed in the Royal Observatory at Edinburgh, on condition that the administration of that establishment is carried on, as heretofore, by the Crown. Professor Piazzi Smyth, who recently retired from office, has from time to time complained of the inadequacy of the present observatory on the Calton Hill. We understand that Government contemplate the erection of a new observatory, and that investigation is being made as to a suitable site for the new building.

THE last number of the *Journal of Hellenic Studies* (IX., No. 1) is the first to appear in the newly-projected form. The size of the text is considerably increased, and the plates are to be henceforth included; the inconvenience of a separate atlas is thus avoided. The supplementary notices on the progress of archæology in Greece, and on important archæological works, are to appear from time to time; the proposed *résumé* of archæological periodicals has to be given up for lack of space. This is no serious loss, as the work is well and succinctly done for English readers by the *Classical Review*, which is in the hands of every archæologist. The new number opens with a paper by Mr. Cecil Smith on "Two Vase Pictures with Sacrifices," the interest of which extends so far beyond the immediate subject that it must be briefly noticed. The two pictures have been ingeniously pieced together by Mr. Smith from fragments which came to the British Museum so long ago as 1846 and 1864 respectively. The first picture represents a sacrifice on the Acropolis, to Athene, present in person. Close to the altar is the sacred olive-tree hung with small terra-

cotta tablets. On the other side is a column surmounted by a votive figure, just such a monument, in fact, as is represented by the inscribed shafts which have been recently found in such numbers in the Acropolis. The chief interest centres, however, in the figure of the goddess herself, which Mr. Smith has been able to put together simply by observing the potter's wheel-marks on the reverse side. The design is evidently inspired by the chryselephantine Parthenos, though it is no servile copy. The helmet is surmounted by the sphinx, and rows of protomoi (busts of animals) fringe the forehead, just as in the Hermitage medallion. Most curious of all, in the vase the cheek-piece of the helmet is left undecorated, but in the original sketch-marks traced upon it, the lines resemble the gryphon chased on the medallion. The artist probably changed his mind, and suppressed this detail as excessive or inappropriate. Last, but not least, one of the fragments bears upon it the troublesome inscription ΦΙΛΟΣΚΕΤ, which was usually taken as a careless form of Philoktetes. In the fragment he has joined, Mr. Smith notes a single *ν*, just at the right distance to give us ΕΠΟΙΖΣΕ . *ν*. So here we have not only a new reminiscence of the Parthenos of Pheidias, but also a new vase-painter's signature. There could scarcely be a finer instance of the possibility of new light from old lamps.

WITH the second set of fragments Mr. Smith links a conjecture of some interest, and which seems to throw some new light on the Parthenon marbles. On the fragment he discusses is a woman figure seated on a horse, which, from the comparison with other designs, is undoubtedly the moon goddess, Selene. This brings us to the east pediment of the Parthenon. Every commentator on this pediment has said that Selene driving her *car* or *chariot* is sinking below the horizon. By a drawing, adapted from a vase, Mr. Smith shows, we think, beyond dispute that she is not driving a chariot at all, but simply riding on a horse. This is far more consonant with artistic tradition; moreover, the folds of drapery on the remaining torso show clearly that the goddess was seated sideways, riding woman fashion, not driving. We cannot even summarise all Mr. Smith's arguments,—indeed, it is the drawing he gives that brings the chief conclusion,—but we cannot refrain from pointing the moral, perhaps nowadays scarcely needed, that a knowledge of vase-paintings is a thing not only pleasant in itself, but also a thing essential for the thoroughly-furnished archæologist.

NOTHING could be much more amusing, or more characteristic of the want of principle with which English daily papers deal with architectural subjects, than the leading article of the *Times* on Wednesday against the enormities of restoration and restorers. Some correspondence of a very gushing description, and, we suspect, very highly-coloured, concerning some destructive restoration work at a little church at Cossey (we believe Costessy is the real name), near Norwich, furnishes, we presume, a hint for a leading article at a time when subjects for such articles are scarce, and so the *Times* waxes suddenly architecturally and archæologically virtuous, and rebukes the offenders in the name of the Society for the Protection of Ancient Buildings. It signifies nothing to the *Times*, of course, that similar work has for years been carried on by an incompetent amateur architect at St. Alban's Abbey, one of the greatest and most interesting of English ecclesiastical buildings, both historically and architecturally; that the aforesaid amateur botcher has had the free use of the *Times* columns to vilify any one who ventured to complain of his proceedings; and that the *Times* has never uttered one word in defence of St. Albans!

Porous Glass.—A Paris firm of glass-makers, Messrs. Apert Frères, has, says a French technical journal, produced some porous glass, to be used for window-panes. The pores are too fine to permit of draught, but cause a pleasant and healthy ventilation in a room.

NORWICH CASTLE AND A PUBLIC MUSEUM.

FOLLOWING an example set to them at Nottingham, the Norwich Corporation have acquired the Castle, and will devote a sum of about 11,000*l.* (whereof the greater part is already subscribed) to converting it from a prison into a civic museum and art gallery. Norwich Castle had its origin in a fort, within three concentric ramparts, which Uffa, first King of the East Engles, established *circa* 575 at North-wic—that is to say, a northern outpost of the Roman military station of Caistor, or *Venta Icenorum*, by the Tese, distant four miles southwards. Subsequently the chief seat of Anna, it was overthrown by the Danes, but rebuilt, it is said, by Knut, who had a palace at Blickling, in the same county. In his account of the fabric (*Archæologia* for 1796, vol. xii., pp. 132–180), William Wilkins observes that "although the building is of Danish workmanship, it is notwithstanding in the taste of architecture practised by the Saxons long before England became subject to the Danes, and it is the best exterior specimen of this kind of architecture extant." The outermost vallum, which may be traced near to St. Andrew's steps and Conisford-street, encompassed an *enceinte* of 23 acres. Next lay the outer ballium and the middle vallum, which have been identified in London and Buffcoat lanes. In the central Castle-hill, of 6½ acres, and 360 yards in circuit at the summit, stands the Keep. Its dimensions are 92 ft. 10 in. north to south; 110¼ ft. east to west; and 69 ft. 6 in. to top of the merlons of the battlements. From the eastern side projects the Bigod Tower, as restored in 1824. It was formerly approached by an outside staircase and drawbridge. The tower is believed to have been built *temp.* William II., and to have been repaired or completed by Hugh Bigod, who was constable in succession to his brother William in the early part of the 12th century. To Bigod, indeed, the rebuilding of the entire fortress has been attributed. The three stories above the basement are faced with arcades of rounded arches ranged between the slip buttresses, which constitute a striking and notable feature of the four elevations. An ancient bridge, rising some 15 ft., crosses the inmost foss. It has a remarkable arch, semicircular, and of 40 ft. span. The bridge was formerly flanked, at the inner end, by two towers, circular on plan, and of 14 ft. diameter.

The interior of the Castle has suffered many and extensive alterations. The shell has served as a prison from a time far remote; as long ago, we read, as the end of the thirteenth century (1293), when Roger Bigod, as Earl of Norfolk, was constable. By an Act of Parliament passed in 1806 the "Castle precinct" was vested, in trust for the county, in the county justices, with power given to them "to build, repair, or alter anything belonging to it as they may think proper." So, in 1824-8, and at a cost of 50,000*l.*, a new county gaol was constructed along and in concealment of the Castle's eastern front, on the site of a prison which had been erected there in 1793, at a cost of 15,000*l.* This outlay had been preceded in 1822-3 by the building of a new county hall and courts on the north-eastern side of the vallum. William Wilkins furnished the designs, after the Tudor style. The original hall, of 1578, on that same site, was burnt; and its successor, of 1749, was demolished. From the year 1597 the city gaol was within the Guildhall until the building of a new City Gaol and House of Correction, without the walls and near to St. Giles's Gate. This was done in 1824-7, at a charge of 30,000*l.*, from the designs of Philip Barnes.

The following couplet was once popular in this district:—

> "Caistor was a city when Norwich was none,
> And Norwich was built with Caistor stone."

Tradition runs that when Uffa settled himself at Norwich—and which in Ælfred's time formed Guthrum's capital—most of the inhabitants of Caistor sought harbourage around the new citadel. Their first bishop was Felix, of Burgundy, *circa* 630; about forty years later the see of East Englia was divided into two bishoprics; Elmham, in Norfolk, and Dunwich, in Suffolk. They remained vacant for a hundred years after the harrying incursions by the Danes. Dunwich was then merged in Elmham. Next Arfastus changed the seat to Thetford. From the last-named place it was transferred to Norwich, in the year 1094, by Hubert de Losinga. There, in 1096, he built him a palace, and founded a cathedral in honour of the Holy Trinity.

An account of Nottingham Castle (garrisoned in 1643 by Colonel Hutchinson), as lately formed into the Midland Counties Museum in connexion with South Kensington, will be found in our report of July 30, 1887, of a meeting of the Architectural and Archæological Society of the counties of Lincoln and Nottingham.

THE BRITISH ARCHÆOLOGICAL ASSOCIATION AT GLASGOW.

CONTINUING our special account* of the Glasgow Congress of the British Archæological Association, we come to Wednesday, Aug. 29, when, notwithstanding the lowering aspect of the clouds, a goodly number of the visitors and their friends took train at the Buchanan-street Station for Larbert, where carriages were to have met them. A violent shower prevented their arrival for some time, and the archæologists were not a little pleased to take what shelter the moderate-sized station could afford. The weather, however, soon cleared, and progress was made to Torwood-head Castle, a Scottish mansion now entirely in ruins, although the masonry is, in parts, strong and solid. The building is of late date, presenting features more of an ordinary manor-house than those of a castle. It enclosed two sides of a courtyard, but the wall of the latter is now levelled. The windows are square, and larger in size than is ordinarily the case in Scottish fortified buildings. After a short inspection under the guidance of Mr. Dalrymple Duncan, F.S.A.Scot., the party proceeded through the adjacent woods to the elevated ground on which stands a monument of antiquity of the greatest possible interest to the visitors, since it is the only example of a class of monuments peculiar to Scotland included in the present year's programme. We refer to the prehistoric Broch at Tapock. It stands on the highest point of the hill, commanding a magnificent panorama of the adjacent country, over the field of Bannockburn, and far away to the left of Stirling. Here Mr. Dalrymple Duncan read a paper descriptive of the structure, as follows:—

The Broch at Tapock.

Among the various relics of the past which time has spared, the Scottish brochs possess a special interest, both because they are a type of building absolutely peculiar to the country, and from the fact that they show the prehistoric artists who constructed them to have possessed alike forethought and resource in working out the idea of an edifice so admirably suited to fulfil the object for which it was intended. A broch may shortly be defined as a hollow, circular tower of dry-built masonry, from 40 to 70 ft. in total diameter, having within the thickness of its wall a series of chambers and galleries, lighted by windows all looking into the central area. The only aperture to the outside is a doorway through a tunnel-like square-headed passage 5 to 6 ft. high, and about 3 ft. wide, constructed in the thickness of the wall. The latter is solid for about 10 ft. from the ground, and is carried up with a clear space of about 30 ft. wide between the exterior and interior portion. Into this hollow, however, horizontal ranges of slabs are inserted at intervals of 5 ft. or 6 ft., thus forming galleries about 6 ft. high and 3 ft. wide, which run completely round the tower. These galleries are connected by a stair which runs up to the top of the tower, and are lighted by windows in the inner wall of peculiar construction, and placed vertically over each other. The central area is from 20 ft. to 45 ft. in diameter. The Broch of Musa, in Shetland, from being the best preserved, offers the most reliable basis for judging of the height to which brochs were built. This broch is 45 ft. high, though incomplete at the top, so that the others must occasionally, at any rate, have reached an altitude of 50 ft. The door of the Tapock Broch was placed about 4 ft. from the outer end of the tunnel-like passage referred to against a rebate in the masonry faced with strong slabs. It was secured by a bar fitting into holes made for the purpose in the side walls. In most cases there was also a guard chamber opening off the passage just behind the door. The object of the builders of the brochs was undoubtedly to provide a place of temporary shelter and defence, to which they could retire with their cattle and other valuables during the raids and

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* See *Builder*, p. 154, *ante*.

forays of foreign marauders, which, at the time of their construction, were constantly occurring in the north and west of Scotland. It is found, therefore, as should naturally be expected, that as a general rule these curious edifices are situated in districts of some fertility, and the buildings most admirably fulfilled the purpose for which they were intended. The height of the surrounding wall was an effectual protection against the feeble missiles in use at the period, while its thickness made it impervious to an attempt to dig through it. The door, again, being of stone, was proof against fire, and being placed 4 ft. within the entrance, could only be reached by one man at a time, whose movements would be impeded by the narrowness of the passage. Dr. Anderson, with reference to brochs, says "that the concentration of effort to the two main objects of space and complete security was never more strikingly exhibited, and no more admirable adaptation of material so simple and uncommon as undressed and uncemented stone for this double purpose has ever been discovered or suggested." But though primarily intended as mere temporary refuges, the brochs were not incapable of standing a siege of some duration. The brochs, as buildings, are unmistakably Celtic in their character, and are peculiar to Scotland. They do not bear any proper relationship to any variety of fortified edifice known in historic times. They have been compared to the round towers; but while in outward appearance there is a certain amount of similarity, and both buildings seem to have been intended for the same purpose, there are marked and signal points of difference. The brochs are dry built, the round towers lime built. No hewn stone is used in the construction of the former, while it is often employed in the case of the latter. The brochs have chambers and stairs in the thickness of the walls, which the round towers have not. The windows of the round towers are in the external wall, and the doors at some height above the ground, while in the brochs the windows are in the inside wall and the doorway on a level with the ground. It is indubitable that the builders of the brochs were a people who had made considerable strides in civilisation, and even attained some measure of culture. The materials and instruments found in brochs indicate that the buildings were occupied subsequent to the Roman conquest of the South of Britain, and that the inhabitants had to some extent come within the influence of Roman civilisation. The examination of the brochs and their contents had revealed a very interesting phase of Iron Age culture, and it seems certain that there is no reason for ascribing a lower condition of civilisation to the occupants of these edifices than to the builders of the beehive huts and dry-built churches of early Christian times. The brochs are mostly found in the district of country lying to the north of the Caledonian Valley, and the isles around the northern and western coasts. Dr. Anderson some years ago made up a list of the brochs in the five northern counties, the figures in which are as follow:—In Shetland there are 75 brochs, in Orkney 70, in Caithness 79, in Sutherland 60, in Ross-shire 38, and in Inverness-shire 47, giving a total of 370. The state of matters south of the Caledonian Valley is very different. At present only three of these curious relics of the past are known to exist in that part of Scotland, partly, no doubt, in consequence of the large extent of cultivated land and the inevitable destruction which befalls such remains of pre-historic times in districts which are constantly turned up by the plough. The Broch of Tapock is situated at the highest point of Torwood, and was first excavated in August, 1864, by Colonel Joseph Dundas, of Carronhall, who read an account of his discovery to the Scottish Society of Antiquaries in March, 1865. Its appearance previous to its excavation was that of a conical hill or mound, flat on the top. On the west side of the mound there is a precipitous crag of about 100 ft. in depth running north and south for about 800 yards. On the north-east and south sides the slope is gradual. At about 70 ft. from the centre of the mound there are the remains of a wall carried round until it reaches the precipice on each side. Beyond this there are the remains of a second wall. Both of the walls, on the earth being removed, were found to be built of large stones, roughly put together without cement. On the other side there are traces of a third wall extending along the face of the cliff, and filling up those places where the rock is not so abrupt as at the other parts. These outworks are not an isolated characteristic of the Torwood broch, as four of the Caithness and Orkney brochs are similarly protected. At the time of Colonel Dundas's excavations the mound was covered with heather and brackens, and overgrown by a clump of large fir trees. Operations were first commenced on the south side, and resulted in the discovery of the staircase, the doorway of which was completely blocked up with rubble. Work was then begun on the top of the mound, when, after the removal of an immense mass of large stones, rubble, and earth, which was thrown over on the east side to the amount of more than 200 tons, the structure was found to be a circular wall 15 ft. thick, enclosing an area of 35 ft. in diameter. At the height of 6 ft. from the floor the upper part of the wall is put back 18 in., thus forming a sort of shelf. The entrance doorway has two of the massive lintels still upon it. It is about 7 ft. high and 3 ft. wide at the door cheeks, behind which are the usual bar holes. The whole length of the passage is 18 ft. 6 in. To the left of the doorway is the staircase, as usual in the thickness of the wall. There are eleven steps, and the length of the passage leading into them is about 12 ft. The height of the wall remaining is not sufficient to show any trace of the galleries, but the presence of the stair implies their former existence. There are no chambers in the thickness of the wall on the ground floor, but all the other features of the building are those of the typical broch. A number of articles were found in the broch at the time of the excavations, and these were presented by Colonel Dundas to the Museum of the Society of Antiquaries in Edinburgh.

A vote of thanks to Mr. Duncan for his paper was proposed by Professor Hayter Lewis, F.S.A., who took occasion to refer to the admirable arrangements which had been made for the comfort of the members by Mr. Duncan and the local committee.

Descending through the tangled bracken and fern of the forest, the carriages were resumed, and a visit was paid to the site of the Battle of Bannockburn, the party alighting at the Bore Stone, now carefully covered over with iron gratings to preserve it from injury. It was here that the standard of Robert Bruce was erected on the ever-memorable 24th of June, 1314. The grand view, extending to the Links of Forth, Stirling Castle, high on its craggy site, backed up by the hills beyond it, was seen to great advantage in the sunlight which had succeeded the storm. The boggy ground around the little stream, the Bannock, which proved to be so fatal to the English, is now drained and turned to agricultural uses, while the village of Bannockburn and the adjacent one of St. Ninians, occupied by Prince Charles Edward in 1746, have grown almost one to another, and the modern houses extend nearly on to Stirling. Newhouse, where the Earl of Lennox, Regent of Scotland, was killed in 1571, is another village which has also undergone great increase in recent years.

On arrival at Stirling, Mr. W. B. Cook read a paper on the town and the Castle, of much research and of great historical value, but all-too-long for the time at the disposal of the party. Under his guidance the principal of the many old edifices of the town were examined, the Church of the Greyfriars being the first at which a halt was made. This church is still divided into two compartments, known as the East and West Churches, used by different congregations, the intended renovation of the fabric and the removal of the modern divisions being (unfortunately), for the time, abandoned. Stirling Church offers many objects of study, and it is essentially Scottish in all its features. It has a semi-octagonal apse; the windows are tall, and filled in with tracings that would, so far as their design goes, be considered of fourteenth century date were they met with across the Border; here they are of fifteenth century date. The apse is roofed externally with stone slabs, being first brought to a square above the parapets. The aisles are lofty, as is the whole of the choir, while the nave is of much less elevation. In the latter, solid Norman-like circular piers support pointed arches and a low clearstory, the aisles having traceried windows of large size. Their date corresponds with that of the circular piers, and is of the fifteenth century. The western tower is very characteristic of Scotland, and it is of late date, erected in stages, with some curious lines of continuous corbelling. Mar's Work, a ruin to the east of the church, erected out of fragments of Cambuskenneth Abbey, is a curious adaptation of some of the ornamental stonework of the church, worked into the walls in odd fashion. Argyle's Lodging is a very fine mansion of the seventeenth century, built by Sir Wm. Alexander, afterwards Earl of Stirling, but now used as a barrack. The time at the disposal of the party was not at all sufficient to do justice to the many buildings of interest which form Stirling Castle, and nothing more was done than for their principal features to be pointed out. The fine old Hall, the Parliament House, is now sadly disfigured by modern barbarisms, as is also the Chapel Royal, a late building, erected by James VI. in 1594, instead of a much more ancient fabric. It deserves a better fate than to have been turned, first into an armoury, and now, in fact, into a receptacle for stores. The Palace itself is sadly neglected and uncared for; many vulgar insertions have been made, the carved cornices cut through for windows, and no signs of care are visible from one end to another of this remarkable fabric. The grand view from the battlements was seen to great advantage. Ever and anon a blaze of sunlight, followed by flickering shadow, would chase one another over the lofty crags far off beyond the town, or a bright rainbow would appear through the dark clouds in the distance. The Tower of Cambuskenneth Abbey was seen in the meadows at the foot of Stirling Hill, but it was impossible to visit it.

At the evening meeting, the audience was divided into two sections, in separate rooms of the Corporation galleries. In the first, a paper was read by Archbishop Eyre on "The See of Glasgow," the chair being occupied by Mr. Thomas Blashill. The foundation of the See was traced from its early beginnings, and reference made to the Bishops and to the change when the See was made metropolitan. After a hearty vote of thanks had been accorded to his Grace, a paper was read by Mr. Allan Wyon, Chief Engraver of Her Majesty's Seals, on "The Great Seals of Scotland." At the other meeting, the chair was taken by Mr. W. H. Cope, F.S.A., and a paper was read by Professor Veitch on the subject of "Merlin and the Merlinian Poems." The references to Merlin in the dim histories of the remote period of British history in which he lived were carefully traced, and also their amplification in histories of later date. An animated discussion followed, and after a cordial vote of thanks to the Professor, a second paper was read. This was by Dr. Collingwood Bruce, F.S.A., on

The Wall of Antoninus.

Dr. Bruce said that before leaving the lowlands of Scotland, Agricola found it necessary to place in garrison some troops in his rear, to render all safe behind him. He could do so most economically by spreading his forts in the narrowest part of the country—namely, that which lies between the Firths of Clyde and Forth. For the same reason, Lellius Urbicus planted his wall there also. This latter general, the representative of the Emperor Antoninus, having dammed back the hostile waves of Caledonians in the year 140, thought it necessary to rear a continuous line of defence from the one coast to the other. This he did by the carrying of a wall from Carriden, on the Firth of Forth, to West Kilpatrick, on the river Clyde. The land between those two shores consisted of a wide valley, bounded on the north by the successive ranges of the Kilpatrick, Campsie, and Kilsyth Hills, and on the south by a continuous chain of gentle eminences, none of them rising to any great elevation. It was along the summits of the gentle southern heights that the Antoninus Wall was carried. The nature of the ground was just that which the Romans always, if in their power, selected for their entrenchments. They disliked the exposure of excessive elevations, and yet they wished at all times to be secure from sudden surprise—an advantage which a moderate elevation gave them. In travelling by the Edinburgh and Glasgow Railway, this arrangement would be noticed at several parts of the route. Antoninus' Wall differed from Hadrian's in having a rampart of earth under the stone; like Hadrian's, it had a deep fosse on its north side and a military way on the south. It was also provided with stationary camps for the residence of its defenders, and some minor structures resembling the mile castles of the southern wall. It strongly resembled in its general character the great German Wall, which still extends from the Danube to the Rhine, which was an earthen fortification. No masonry whatever was used in its construction. Unhappily for the purposes of the antiquary, Graham's Dyke lay in the district which is

traversed by the lines of communication uniting the eastern with the western seas and the two great metropolitan cities of Scotland—Edinburgh and Glasgow. The progress of improvement had done much to obliterate the lines of Lellius Urbicus. The lecturer had been informed that when the traffic between Edinburgh and Glasgow was carried on by means of pack-horses, they travelled along the Roman military way of the wall. For fourteen centuries that *via militaris* served the necessities of the district. The same was the case with the Northumbrian Wall. Changes, however, had been made, and unfortunately the wall had suffered severely by them. It was now but the wreck of its former self. It was only here and there that it appeared in its native majesty. They did not know the name of any one of the camps, nor with what troops they were occupied. But from the altars and inscribed slabs which were found in the forts they learned that various corps of Gauls, Germans, and other foreigners in the Roman service were stationed along the isthmus, besides detachments of legionary troops.

A hearty and well-merited vote of thanks was rendered to Dr. Bruce for his paper, and the proceedings terminated at a late hour.

Thursday, August 30, was devoted to a visit to Rothesay, and, by invitation of the Marquis of Bute, the President, to Mount Stuart. The party embarked on board the fine steamer, the *Columba*, and on the way down the Clyde passed the lofty rock of Dumbarton, crowned by the ugly, barrack-like buildings of the present castle, which disfigure the site, and the Castle of Newark, on the opposite bank of the river. This building is a fine example of a seventeenth-century dwelling-house, adorned with many signs of castellated style, for ornament more than defence. One of the towers of the castle is, however, a quadrangular keep of an older building incorporated with the more modern structure. It is still perfect, and occupied by working men's families, the site being used for shipbuilding works close up to its walls. On arrival at Rothesay, the party proceeded to the Castle, which has recently been repaired to some extent by the Marquis of Bute, who has had the ditch cleared out and filled with water, many irregular buildings removed to clear the site, and the banks planted with trees. This celebrated ruin now stands out fully to view, and it is an object of much interest, but its position is low, and it is not therefore seen at any distance. The ancient timber drawbridge across the moat has been restored, under the care of the late Mr. William Burges, and when the work was in progress the base of the ancient timber bridge was found. The Rev. J. King Hewison, F.S.A. Scot., conducted the party over the Castle, and described its history. It is circular in form, somewhat irregular, 135 ft. in diameter, the enclosing curtain-wall being 8 ft. thick and 20 ft. high. There are four circular towers at equal distances along the wall, and, central between two of them, the square tower of approach is erected. It is of later date, although it encloses the older entrance. The Castle dates from early times; Husbac, King of the Sudreys, besieged it in 1228, killing the Steward of Scotland on its walls. It was again taken by an officer of King Hæco in 1263, partially destroyed in 1312, rebuilt in the time of Edward Baliol, improved both by Robert II. and Robert III., occupied in 1650 by Oliver Cromwell's troops, and destroyed by the Duke of Argyle in 1685, since which time it has remained a ruin. Mr. Loftus Brock, F.S.A., described some of the architectural features of the fabric, which he said belonged to the oldest class of castles remaining in Scotland; he said that the masonry was covered with diagonal tool-marks, and, as at Bothwell, the towers were boldly projected beyond the curtain-wall,—a feature which is found equally in all the other Scottish castles of the early date of the work here, namely, about the middle of the twelfth century. He then compared the fabric with other circular buildings in Cornwall and elsewhere, which are different in detail, and with French work; but the resemblance to the latter is no more than exists in English fortified works of the same date, both alike receiving some inspiration from Continental examples.

The ruined chancel of the parish Church of St. Mary, Rothesay, was then inspected. It is filled with tombs of good design and fairly good execution, now overgrown with weeds and creepers. On adjourning to the church beside it,—a plain, barn-like structure,—Mr. Hewison gave an interesting description of the monuments, which are to the memory, according to some authors, of King Robert II. or Robert III., but one of them may be the tomb of Walter, the eighth hereditary Grand Steward of Scotland. The second effigy was believed to be that of Marjory, the daughter of Robert Bruce, and the third that of Angus, Lord of the Isles, who died in 1210. A Celtic cross, recently found, was also described, and allusion was made to two stones with interlaced patterns, now preserved in the Castle. Mr. John Honeyman made some remarks upon the architecture of the chancel, which is of the thirteenth century. Mr. Brock expressed regret that monumental works of so much beauty and interest should be allowed to rot away, and urged that some steps should be taken to preserve them from injury.

Carriages being resumed, the party, about 200 in number, proceeded along the seashore to Mount Stuart, the seat of the Marquis of Bute, who entertained them at luncheon in the beautiful hall of the mansion, a new building erected from the designs of Dr. Anderson. It is lined profusely with costly foreign marbles of great beauty.* The party then drove to the south end of the Isle of Bute, passing the standing stones of Lubas, and making a halt at the ruined church of St. Blaine. It consists of a nave and chancel, the chancel arch being of Norman form, and the fabric being decorated with ornamented stringcourses and base-mouldings, the oldest portion being constructed with squared stones. The chancel is built of rubble, with two lancet windows at the east end. Here Mr. Arthur Cates pointed out that the rubble work was not of earlier date, as had been asserted locally, and showed that in many cases the older squared stones of Norman times had been reused when the extension was made. Mr. Hewison described the graveyards, which are on two levels, one having been used for males and the other for females, until the practice was stopped about 200 years ago by the Scottish Presbytery. The church has been disused for public worship for many years, owing to the migration of the population to other parts of the island. The party saw no signs of work of earlier date than Norman times; but close to the remains, on the north side, are traces of a remarkable circular structure, about 32 ft. wide, called the "Devil's Cauldron." Its thick walls are Cyclopean in construction, and it much resembles the Broch of Tapock in appearance, but its uses for defence are doubtful, since it is partly built into the side of a hill, which entirely commands it. In connexion with this curious structure is a long length of Cyclopean walling, which leads up to it. The vitrified Fort of Dunagoil, on a rock adjoining the seashore, was seen from some little distance. Returning through country of very great beauty to Kilchattan Bay, which had been passed *en route*, a special steamer conveyed the party to Wemyss Bay, whence Glasgow was reached by rail, a hearty vote of thanks to the Rev. Mr. Hewison having previously been given.

Friday, the 31st, was devoted first to a visit to Paisley Abbey, where the party was met by several of the inhabitants, including the Rev. Mr. Dalgetty, the Rev. Dr. Henderson, Dr. Richmond, Mr. Barbour, M.P., and others. After the members had assembled within the church, Mr. Loftus Brock gave a lecture upon the building. After having briefly traced its history, he proceeded to explain the appropriation of the various portions of the Abbey which remain, and referred to their evidences as to the dates of their erection. The earliest parts are the wall of the south aisle and its eastern return to the curious chapel dedicated to St. Murren, an early saint of the Celtic Church. This fragment of old wall proves that the chapel, which occupies an anomalous position south of the south transept, has always existed there since the foundation of the Abbey in the latter half of the twelfth century. Possibly an ancient church had occupied the site at an anterior date. There are evidences that early in the thirteenth century, when the present front was erected, preparation was made for two western towers, the lower stages of which remain, although the upper part of the front is of a date after the burning of the church by Edward I., the large gable window being still later. The nave assumed its present form in the middle of the fifteenth century, and it is mostly the work of Abbot Tarvas. The chancel, which is aisleless, and without any buttresses, the walls being reduced to about 10 ft. in height, was most probably erected by Abbot Shaw at the close of the fifteenth century. Judging from the thickness of the walls and the absence of buttresses, the chancel must have been aisleless, and probably agreed in height with the ruined transepts; it was without stone vaulting. Evidences showed that the nave also was timber-roofed. The central tower could have had no very great elevation, for what remains of two out of the four piers show that they were not capable of supporting any very excessive weight. What was erected even did not stand, and the fall of the tower caused violent dislocation of the masonry, visible at the present day. The stones have a large number of masons' marks, a critical analysis of which seems to bear out the dates given for the various parts, since, for instance, of those in the nave, hardly any occur in the chancel, where the greatest number of marks are still to be found. Mr. Ewan Christian pointed out in the chancel that a certain number of the stones bore marks of fire, showing that they probably belonged originally to the church burnt by the forces of Edward I. Great regret was expressed at the demolition of the cloister buildings only a few years ago. A subterranean passage, going south by west, discovered about fifteen years since, was then entered. It proved to be a work of some importance, the sides being formed of very neatly-squared stone, the Gothic arched roof having similar ribs about every 10 ft. apart. The passage, by the nature of its workmanship, appears to have been something more than a mere sewer, and, although it is on the side of the Abbey where the kitchen buildings would have been, yet it does not lead direct to the river. It was found at a point not far from the new Infirmary bridge, almost in the centre of the roadway, south of the site of the Chapter-house, and it extends somewhat parallel with the river.

Some of the party then proceeded to the Museum with Dr. Phené, F.S.A., to inspect some ancient British urns found by him on Cumbrae Island.

On returning to Glasgow, the large party was entertained at luncheon at the Exhibition, in the Royal Bungalow, after which the collection of antiquities of the Hunterian Museum, in the New Glasgow University adjoining, was inspected, under the guidance of Professor Young. The extensive and remarkable collection of coins and other antiquities was inspected and described, and at the appointed time an adjournment was made to the model of the Castle of the Bishops and Archbishops of Glasgow, which has been so admirably reproduced in the Exhibition grounds. Here the party was met by the Lord Provost, Sir James King, Sheriff Berry, Sir Wm. Collins, Mr. Wylie Guild, and many other members of the Reception Committee. After the Lord Provost had welcomed the Associates in the name of the Reception Committee, a private view of the remarkable and unique collection of Scottish antiquities which has been brought together within the walls took place. The pictures, the portraits of Mary, Queen of Scots, the relics of the Covenanters, and of the Pretenders to the throne, were all eagerly scanned, and not a little gratification was expressed at such a large and important series of articles being still in existence, mostly in private possession.

An evening meeting was held in the Corporation Galleries, the Marquis of Bute, President, occupying the chair. In his opening remarks, the Marquis referred to certain arrangements of the crypts of foreign churches, which agree with those of Glasgow Cathedral, and he referred to the ease with which additional and better accommodation for Presbyterian worship could be obtained by fitting up the nave, instead of the chancel, as is at present the case.

Mr. Thos. Morgan, F.S.A. read a series of notes on Ancient Scottish History, after which a paper was read by Professor T. Hayter Lewis, F.S.A., on

Masons' Marks.

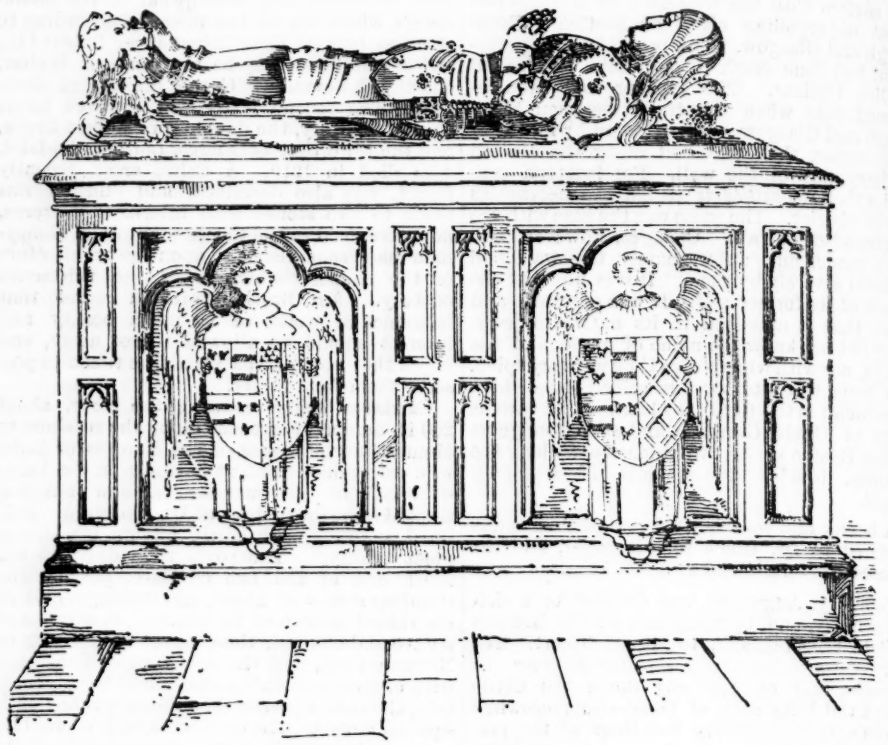
Professor Hayter Lewis said that Scotland possessed a larger number of such marks than could be shown down south. They were found cut on the stonework of nearly every mediæval building of importance, and on very many buildings of greater antiquity. Such marks were now used as much as they ever were, but they were hidden. Proceeding, he said that

* It may be mentioned here that in the *Builder* for May 5 last we gave illustrations of a series of wall-paintings executed for the Marquis of Bute at Mount Stuart House by Mr. H. Walter Lonsdale. These paintings, which form a frieze about 5 ft. deep in one of the large apartments, illustrate scenes in the life of St. Margaret, Queen of Scotland.

the first point was to ascertain whether they were hereditary, descending from father to son, with such slight alterations as might serve to distinguish them from each other. Certainly, in many cases it was not so. On the other hand, there were cases in which the same marks were used at the present day by members of distinctly the same family, there being some slight differences for the sake of identification. The next point was—was there any distinct mark which would serve to distinguish the members of any particular lodge or company? and he might say shortly that he could see no sign which would thus define a separate group of workmen—such a sign, for example, as that of the crown above the hammer, so well known on Scottish tombstones. Yet there were certain cases in which one would expect to find them if, as was generally supposed, the companies were under clerical guidance. The only method left by which one could trace the work and the progress of any particular lodge or fraternity from one building to another, or from one date to another, so as to ascertain the progress of an art by the consecutive history of two or more buildings, was by taking a group of separate but well-ascertained marks in one of them and tracing out the same marks, if possible, in another. All evidence seemed to point to there having been bands of skilled workmen attached to great monasteries, cathedrals, and, in later times, large cities, whose example and training influenced the districts around. When works of great magnitude were in hand, these bands were, no doubt, increased; and when the works ceased, they were lessened in number, the members dispersing here and there, and leaving their marks in various places, much as masons now did at the finish of some great work. But he found no distinct trace of the general employment of large migratory bands of masons going from place to place as a guild or brotherhood. As to whether they could find any distinct change between the marks of the twelfth and thirteenth centuries, when the great change took place in the tooling and the style generally, he felt bound to say that he could not see any distinct or general sign of change. Generally it was found that the same forms which were used in early times were continued in the later, though they were then made more ornate. Putting together the information which they had, they found that certain definite methods of marking the general surface of the stones characterised the masonry of the style which was called Norman; that in the thirteenth century there was introduced with the Early Pointed style an entirely different method of finishing the surface, and that the source of this method was apparent from the East; that masons' marks did not appear to have been commonly used in Europe until late in the twelfth century, and that some of the most prominent of those marks appeared to have been used continuously from very early times in Eastern countries.

The proceedings of the evening were brought to a close by a paper from Dr. Phené, F.S.A., on "Further Discoveries of Mounds in the Forms of Animals." Taking up the subject from a former paper descriptive of such mounds in North America, the lecturer passed in review a large number of similar formations in the shape of a serpent, the head being conspicuously marked, and there being certain furrows on the back containing charcoal, burnt bones, and other marks of the presence of man.

On Saturday, September 1, the day opened with gloomy rain-clouds, and many signs of unpleasant weather. A large party, however, eighty or ninety in number, proceeded, notwithstanding, to visit Doune Castle and Dunblane Cathedral. The first stopping-place was at the huge camp at Ardoch. On the arrival of the party, Professor Young led them into the largest of the formations, an earthwork more or less a parallelogram in form, the corners being rounded as is ordinarily the case in Roman forts; but the peculiarity in this case is that, instead of deep ditches, there are several smaller ones. The place must have been a perfect labyrinth when these were open to their full depth and crowned by palisades. There is a raised platform or prætorium in the centre. In addition to the main figure, long lines of earthworks, of no great height, extend in many directions, the whole area occupied being very extensive. The site is on somewhat low ground in relation to the surrounding country, it being about 15 ft. or 20 ft. above the little river at its base.



Tomb of Thomas Cokayne (1488), *Youlgreave Church.*

Through a family bereavement, it was impossible for the party to be entertained at Ardoch House by its owner, Mr. M. Bullock. A neighbour promptly and kindly promised to render this courtesy to the members, but a previous offer having been made and accepted, the party proceeded to Deanston, where, in a marquee erected in the grounds of Deanston House, the party was entertained at luncheon by Mr. and Mrs. John Muir. Thanks having been proposed by Mr. Thos. Blashill, and heartily rendered, Doune Castle was visited, and a paper descriptive of the ancient fabric was read by Mr. Dalrymple Duncan. The party saw the Castle in its greatly-improved condition, its owner, the Earl of Moray, who takes great interest in the old home of his ancestors, having been at great pains in arresting its decay. It is now roofed in, and a very conservative repair has taken place. The ancient arrangements are all but perfect, and the fabric can now be studied with great advantage. The Castle is of fifteenth-century date, and like many other buildings in Scotland, has never been completed. Its position is one of great beauty, and the lofty towers and walls make an admirable group, the picturesque effect being greatly enhanced by the waters of the swiftly-flowing river at the base.

Dunblane Cathedral was then visited. It consists of a lofty chancel, a long, roofless nave and side aisles, and a Romanesque tower on the south side of the aisle, a relic of an older church, which appears to have stood to the south of the present fabric, and on a slightly different axis. It projects into the south aisle. The Rev. A. Ritchie, M.A., having described the Cathedral, the Rev. Professor R. Storey, D.D., referred to the fact that the site was of interest to the student of Scottish history, as one of the settlements of the ancient Culdees, of the Celtic Church, and the continuity of the existence of buildings on the spot for many hundreds of years was of much interest. Dr. Rowand Anderson, architect, who is about to restore the nave, then described the intended works. No attempt will be made to renew the worn stonework, except where there is a structural defect, and the new roof will be of timber. The party listened to these explanations with considerable interest and satisfaction. The building has been roofless for a period long anterior to the Reformation, and it is good evidence of the solidity of the fabric and the goodness of the work that, notwithstanding the action of the elements for several hundreds of years, the stone is only a little weather-worn, and the walls are still solid. Two Celtic stones have recently been found—one a large standing stone worked with a tall Latin cross, of Irish type, on one side, and with figures and circles on the opposite one. The second stone has delicate interlaced work on the edge.

Owing to the length of the journey, no evening meeting had been arranged for.

We will conclude our account of the meeting next week.

SKETCHES ILLUSTRATIVE OF THE "A. A." EXCURSION.

WE have already given a pretty full account of the Architectural Association's Excursion.* We this week give ink-photo illustrations of Wollaton Hall and Youlgreave Church, as well as some illustrative sketches of other buildings visited by the excursionists.

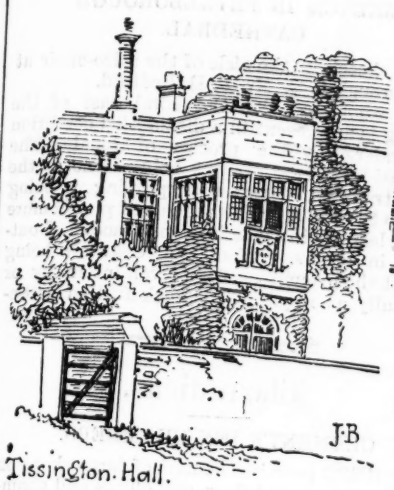
It has often been said, and perhaps more often thought, that the Architectural Association Excursion is such a "dreadful rush" that there is barely time to see the buildings visited, much less to sketch them, and on these grounds alone some have been deterred from joining the party. There is, of course, some truth in the charge, and more particularly was it the case this year, when it was found absolutely necessary to leave out some of the subjects down in the programme on three days out of the five.

But if there are any who think there is little or no sketching done on the excursion, they would be agreeably surprised could they see the sketch-books after the final dinner on the Friday evening, when it is usual to exhibit them. If all these sketches and measured drawings could only be collected, arranged, and published together, there is no doubt they would form as varied and interesting a volume as any of the same class which have seen the light of late years.

The first day was not a productive one, from a purely sketching point of view; the subjects were too numerous, the distances between them, being great, took up a lot of time; but, worst of all, the weather was cold and wet, and had a very depressing effect upon the most enthusiastic. However, by the time Etwall (the last place on the day's programme) was reached, the rain had cleared off, and the cheering effect of a gleam of sunshine was at once seen, for there were more sketch-books out and pencils at work than had been the case during the whole of the preceding part of the day. The Gospel shelf on the north side of the chancel at Etwall is an unusual feature; but the almshouses on the north side of the churchyard received the greatest attention, and were sketched from several points of view. The central feature on the inner side, with its enriched pediment and inscription, is given in a general sketch.

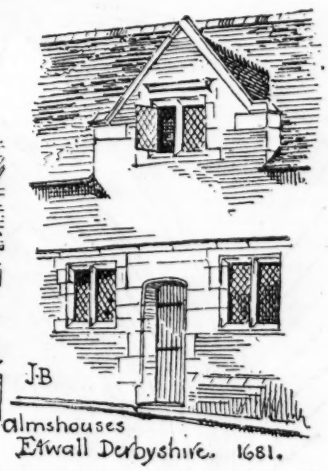
Tuesday was just as fine as Monday had been wet, and no time was lost as the buildings were reached in transmitting some of the more striking features to paper. Wingfield is a subject more for the brush than the pencil, and

* See *Builder*, pp. 117, 135, *ante*.

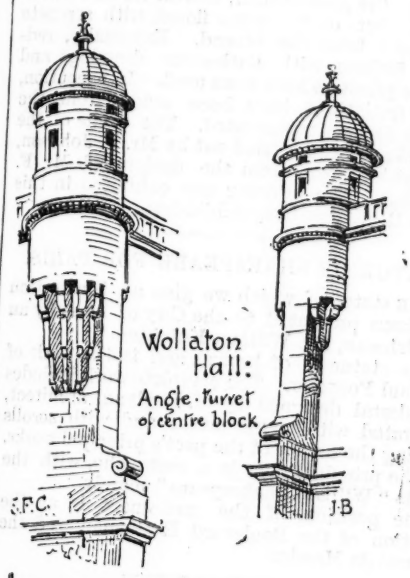


Tissington Hall.

Etwall Almshouses.



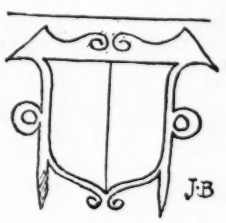
almshouses Etwall Derbyshire. 1681.



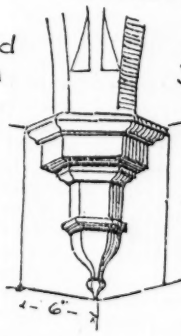
Wollaton Hall: Angle-turret of centre block

R.W. Head Wollaton

Broadburne Ch:

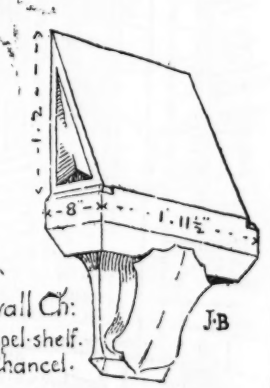


Incised Slab. (1613.)

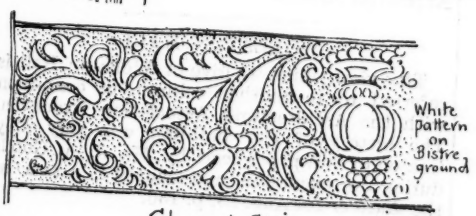


Bolsover Castle: Corner Corbel to Vault. room in Bailey ward

Pedestal on Tomb Bakewell. Ch:



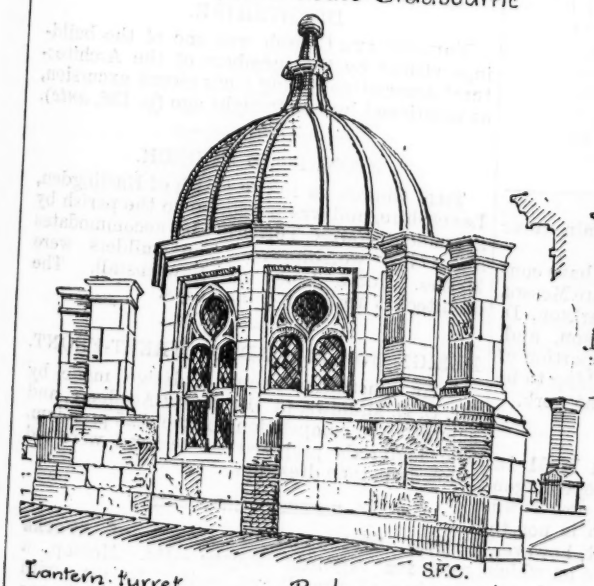
Etwall Ch: Gospel-shelf in Chancel. J.B



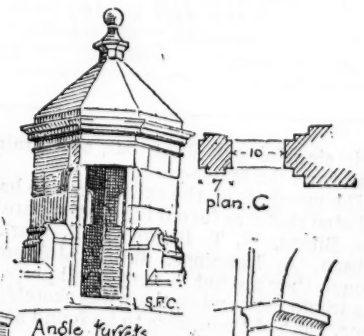
Glass in Staircase Window. Manor House Bradbourne

Bakewell Ch:

Frieze on Alabaster Tomb of Sir John Manners

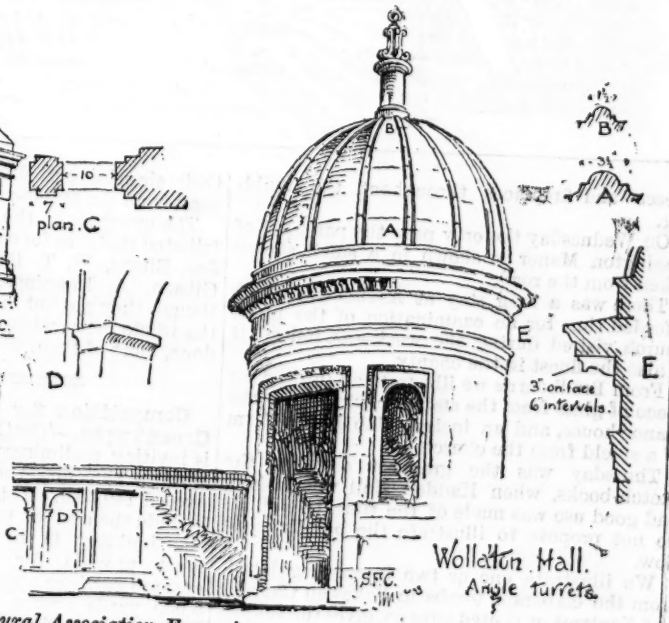


Lantern turret.



Angle turrets.

Sketch plan.

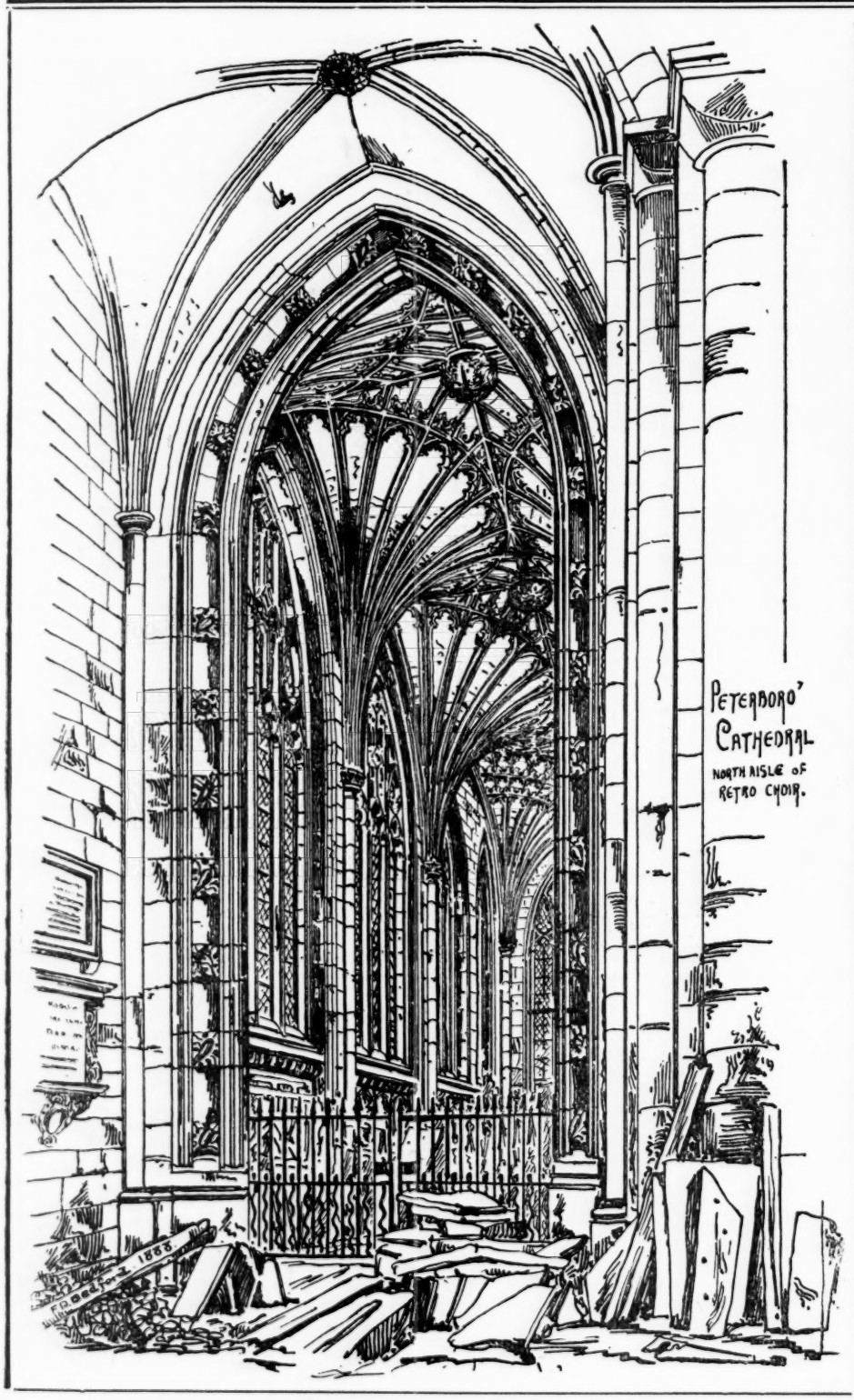


Bolsover Castle

Wollaton Hall. Angle turrets

Sketches Illustrative of the Architectural Association Excursion.

Hardwick did not afford a great amount of interesting detail; but Bolsover Castle was full of choice bits, and there being a fair amount of time allowed there, as much work was done as at any of the places visited. The lantern-light and angle-turrets taken from the lead flat are marked features in almost every view of the castle; the turrets being treated as octagons on the inside, whilst retaining their square form on the exterior, and the embattled parapet being carried round the turrets, but attached to them: the sketch-plan will best explain this. The stone flagging in the Pillar-room is simple and effective; and the corbels receiving the vaulting ribs in the room in the Bailey ward appear to do their work well; but the greatest interest was evinced in the wonderful variety and treatment of the chimney-



pieces and fireplaces throughout the building.

On Wednesday the only peep the party got of Tissington Manor is shown in a small sketch taken from the road.

There was a long stay at Ashbourne, which afforded time for an examination of the finest church visited during the week—as, indeed, it is also the finest in the county.

From Bradbourne we illustrate an interesting piece of glass from the staircase window of the manor-house, and an incised slab in the form of a shield from the church.

Thursday was the grandest day for the sketch-books, when Haddon Hall was visited, and good use was made of the time, though we do not propose to illustrate the building just now.

We illustrate one or two interesting details from the elaborate tombs in Bakewell Church; and Youlgreave, visited later on, gives the subject of one of our plates, which shows the stately western tower, from a rapid sketch by Mr. J. Johnson. A careful and delicate drawing by Mr. Gibson of the beautiful altar-tomb in the chancel to Thomas Cokayne is given on page 176.

Friday's visit to Wollaton gave the subject for another plate, also by Mr. J. Johnson; and there are also other "bits" as sketches, notably the angle pavilion and angle turrets, with their singular corbelling out, and a rain-water head from the stable-yard.

The members of the excursion who have contributed sketches for our illustrations are Messrs. Jas. Bilson, W. T. Brown, S. F. Clarkson, D. Gibson, A. Hennings, and J. Johnson, and, though they are but a very small proportion of the whole party, when there was sketching to be done, most of them were to be found at work.

Competition for a New Town Hall in Copenhagen.—The Corporation of Copenhagen is inviting preliminary designs for a new Town Hall in that city, the cost of which is not to exceed 140,000*l.* This sum does not, however, include the cost of preparing the site on which the building is to stand, &c. The design must provide for an entrance hall, with covered carriage approach, a covered courtyard 3,000 yards square, and an assembly hall of 1,000 yards, besides magisterial offices, library, police office, fire station, residences for officials, and a restaurant. It is to be lighted by the electric light. The design must be sent in by March 1, 1889, and for the three best, premiums of 300*l.* and 200*l.* each will be given. Final drawings and plans, with estimate of cost, will then be invited from the competitors selected, of whom the successful one will receive a sum of 500*l.* and the others one of 160*l.* each.

SKETCH IN PETERBOROUGH CATHEDRAL.

THIS sketch in the aisle of the retro-choir at Peterborough is by Mr. F. D. Bedford.

The whole of the Cathedral east of the crossing is at present in a dismantled condition and undergoing the process of repair. The principal work is at present being done in the north transept, where underpinning is being done to the walls, which are out of plumb more or less, leaning inwards in some places and outwards in others. "Toe" buttresses are being built at the ground or floor level, internally or externally as required, to check further settlement.

Illustrations.

CLEMENT'S INN CHAMBERS.

THESE premises consist of large shops on the ground-floor, and offices and chambers on the upper floors, with separate entrances from the Strand. Externally, red-brick facings with Bath-stone dressings and granite pilasters have been used. In execution, some deviations have been made from the design as here represented. The whole of the works have been carried out by Mr. F. Johnson, of Walthamstow, from the designs of Mr. F. Hemings. The drawing was exhibited in this year's Royal Academy exhibition.

STATUE OF SHAKSPEARE FOR PARIS.

THE statue of which we give an illustration has been presented to the City of Paris by an Englishman, Mr. William Knighton.

The statue is of bronze, and is the work of M. Paul Fournier. The complete work includes a pedestal designed by M. Deglane, architect, decorated with tragic masks and with scrolls bearing the names of the poet's principal works. On the principal face is a cartouche, with the words "William Shakespeare" merely.

The position of the monument is at the junction of the Boulevard Haussman and the Avenue de Messine.

WOLLATON HALL.

THE view which we give of Wollaton Hall is referred to in another column, in connexion with the Architectural Association Excursion. The history of the building was very ably treated of in a paper read by Mr. J. A. Gotch during the excursion, and printed *in extenso* in the *Builder* for Aug. 25, p. 136.

TOWER OF YOULGREAVE CHURCH, DERBYSHIRE.

YOULGREAVE Church was one of the buildings visited by the members of the Architectural Association during their recent excursion, as mentioned by us a fortight ago (p. 136, *ante*).

STONEFOLD CHURCH.

THIS Church is in the parish of Haslingden, Lancashire, and was presented to the parish by a resident,—Miss Turner. It accommodates about 300 worshippers. The builders were Messrs. Moore Bros., of Rawtenstall. The architect is Mr. Basil Champneys.

DESIGN FOR A LONDON STREET-FRONT.

THIS illustration shows a design made by Mr. C. E. Mallows, in the Royal Academy, and submitted in competition for the £25 premium. The materials proposed to be used were red brick and stone dressings.

The Metropolitan Board of Works and its Agenda Paper.—Mr. Mossop, a member of the Board, writes to say, with reference to a "Note" that appeared in our last issue, that while our description of the agenda-paper was quite correct, and in accordance with the facts, a reform in the direction indicated was made about a month before the recess, when the "papers" were put in order and sewn together, so that in this matter there is now order instead of chaos. We are very glad to hear it, but we must say that the last of the Board's agenda papers which we saw (for a meeting only two or three weeks before the recess) did not exhibit any change for the better.

THE METROPOLITAN BOARD OF WORKS INQUIRY COMMISSION:

FURTHER EVIDENCE.*

MR. GEORGE EDWARDS, sworn and examined by the Chairman of the Commission (Lord Herschell), said he had been for nearly fifteen years a member of the Board, and was one of the representatives of the parish of St. Marylebone. He was deputy-chairman of the Board for the two years ending at Midsummer last. He was a member of the Board at the time that the sub-committee that used to deal with compensation cases ceased to exist. That was a sub-committee of some fifteen or seventeen members. Witness, soon after he became a member of the Board, moved that questions of compensation should be referred to a committee of the whole Board instead of to a sub-committee. His reason for taking that action was that he used to sit next to Mr. John Orde Hall, a solicitor (since deceased), who at that time was the representative of Holborn. Mr. Hall was on the sub-committee in question, and from him witness learnt of certain things which made him think that some claims were settled not quite to the interest of the public, and he thought it would be much better for the whole Board to decide such questions. At that time the negotiations for compensation in connexion with the Harrow-road improvement were going on. Witness carried his motion, and since then questions of compensation had been settled by a committee of the whole Board, meeting prior to the Works and General Purposes Committee on Monday mornings. Asked whether he did not think that the committee of the whole Board was too numerous a body to go into detail, witness said he did not think so. The Compensations Committee met before twelve o'clock,—at eleven, or half-past eleven, according to the number of claims to be considered. The Works and General Purposes Committee met at twelve o'clock. As a rule, there were only fourteen or fifteen members of the Board who attended to compensation work, and they were pretty nearly always the same members. The number of members present during the discussion of compensation business never exceeded twenty. The Board from time to time became possessed of a large amount of property in the shape of surplus lands resulting from the carrying out of improvements. The management of this property was always in the hands of practically the whole Board. There was no separate Estates Committee. When a street improvement had to be made, the ground was cleared soon after the property had been acquired, and the improvement was carried out from the plans and under the superintendence of the Engineer. The Engineer laid his plans of the surplus lands before the Board, and these surplus lands were afterwards plotted or divided by the Architect. Afterwards, tenders were invited for the several plots. Asked whether these arrangements did not place the Board very much in the hands of its officers, the witness said that when the plans came up from the Engineer and the Architect, there were some very pertinent questions put to both those officers about the property, especially as to lines of frontage and the arrangement of the street generally. The plans submitted by the officers were not always approved. Witness had taken an active part in the inquiry into Mr. Robertson's conduct, and had never voted in his favour. He personally was never very much guided by Mr. Goddard's advice in questions of compensation. The way in which compensation cases were managed was this: Mr. Goddard used to act for Mr. Vulliamy, and used to give the Committee his valuation of the freehold and the leasehold. Then they used to have a report from Mr. Gunn, the Accountant, as to the inquiries he had made with reference to the trade done. Mr. Gunn used to go through the books and read to the Committee what returns had been made and what profit they showed. The Committee very frequently differed both from Mr. Goddard and from Mr. Gunn, and then they asked that further professional opinion might be taken, and cases in which that occurred were adjourned. The reports of the officers named were not copied and distributed to each of the members of the Committee; they were merely read out. Lord Herschell remarked that this did not seem to be a very good way of arriving at a sound conclusion,—a number of people hearing figures read out. Witness said that the members very soon took the figures down. In the course of re-examination by Mr. Meadows White, Q.C., the senior counsel for the Board, witness said that Goddard was the officer chiefly charged with the preliminary work of investigating compensation claims and expressing his opinion upon them. That was nominally Mr. Vulliamy's work, but Goddard was really the man who did the work. Asked whether he had had any suspicion, until recently, of Goddard's honesty, witness said that the first suspicion he had was on a certain reference made by him to Mr. Villiers, as to whether he (Villiers) would advance on his offer for the Pavilion site. Goddard came back and said that he had committed the Board. Witness put together the two circumstances that Goddard had first of all introduced Villiers and had then so hastily committed the Board, and he began to have very grave suspicions of Mr. Goddard. The Chairman (Lord Herschell) said he thought it was Mr. Vulliamy who had hastily committed the Board in the matter of the disposal of the Pavilion site? Witness said that nominally it was so, but he and other members always "read between the lines" of the "Architect's Reports." Mr. Vulliamy was so weak that he was an inefficient officer. Goddard and Robertson were Mr. Vulliamy, practically, for the last four or five years of Mr. Vulliamy's tenure of office. Witness had for years endeavoured to convince his colleagues that they ought to insist upon the resignation of Mr. Vulliamy.

Mr. G. B. Richardson, sworn and examined, said he had been a member of the Board since 1862; that he had been deputy-chairman of the Board; and that he had served on almost every one of the Board's committees, except the Building Act Committee. He had lately, as he had done on several previous occasions, made some remarks upon the fact that the Building Act Committee did not always give the reasons for their actions. He had always been complaining, more or less, that that Committee did not communicate the reasons why they refused the applications which were made to them. When witness was appealed to, by those whom he represented, to ascertain the cause of such refusals, he was always able to get the information, either from the Superintending Architect's office, or from some member of the Committee, and he never could see any reason why the grounds for refusing a building application should not be communicated to the applicants. There were more complaints brought against the Board through the action of the Building Act Committee than through any other committee. The procedure of the Building Act Committee, indeed, had provoked much of the hostility manifested by the public towards the Board. He had recently stated that the reticence of the Committee as to the cause of the refusal of applications led to fees being paid to get matters put forward, and to delay and corruption. He had not formed that idea prior to the institution of the present inquiry, but he had previously from time to time protested against the action of the Committee merely as a matter of principle and business-like conduct. To take an instance: A person sent in an application to be allowed to bring his house out to a certain line, and the Committee did not agree to that particular line. They would have agreed to another line, but instead of telling the applicant to what line they wanted it to come, they left him to make another application, and when he made the right application it was granted; but, of course, this involved a great deal of delay. Witness had formed very much the same opinion of Mr. Vulliamy that Mr. Edwards arrived at,—namely, that Mr. Vulliamy was too much in the hands of Goddard and Robertson. Mr. Vulliamy was for very many years an excellent officer; but of late years he had been very deficient—so much so that although he (witness) was a very old friend of Mr. Vulliamy's, he had again and again urged the Chairman of the Board to induce Mr. Vulliamy to resign. During the last few years that Mr. Vulliamy held office there was really no proper head to the staff of the Architect's Department; anyone who took an active part in the work of the Board could see that Mr. Vulliamy was more the servant of the staff than the head of the staff. But Mr. Vulliamy was very loth to leave. His pecuniary position was not of a very first-class kind. He knew that if he left the Board he would not perhaps be able to provide for his wife and daughters the same comforts that they had hitherto had, and he was very unwilling to go. When his resignation was tendered, it was not voluntarily tendered; it was written because it was communicated to him that it was desirable and necessary that he should resign. The matter of urging Mr. Vulliamy to resign was not formally brought before the Board, but it was indirectly. Nobody seemed to be inclined to take the initiative in the matter. The members of the Board all liked Mr. Vulliamy as a man. He was a gentleman in every sense of the word, and one with whom it was impossible not to sympathise. They all felt that to tell him to go would be a most unpleasant duty. It was ultimately done in this way:—A Committee was appointed to consider the whole question of the staff of the Superintending Architect's Department, and then, in that Committee, remarks were made bearing upon Mr. Vulliamy's inefficiency; and in a kind, courteous way, he was informed of the feeling of the Committee. He shortly afterwards sent in his resignation. There was no other department of the Board which was ever in so unsatisfactory a condition as the Architect's, unless one went back to the early period of the Board's existence. At that time they had an Accountant who was utterly inefficient; but the present Accountant, Mr. Gunn, was an admirable officer, and his department, since he had been there, had been in perfect order. He did not believe that any Board's accounts were kept in so admirable a manner as theirs. Witness had no reason to suppose that there was anything unsatisfactory about the acceptance of any of the tenders for the execution of the Thames Embankment or other works: there had never been the slightest attempt at favouritism at all. The tenders submitted were dealt with on their merits, and if the lowest one was not put in by a man who was deemed to be utterly incompetent to do the work, it had always been accepted. Witness had never had any faith in Mr. Robertson since the year 1875, when the question of his disposal of a copy of the Board's reference book of compensation claims was raised. As to Mr. Goddard, he had no reason to suspect him; he believed him honest.

Mr. James Beal, sworn and examined, said he had taken a great deal of interest in the Metropolitan Board of Works and its proceedings since its origination. He alleged that the method of the Board's former procedure in requiring sureties for the due performance of a contract was corrupt. Mr. Ridley, who tendered for a part of the Embankment, offered to deposit 30,000*l.* in cash, but his offer was not accepted.

Mr. William Webster, sworn and examined, said he was the son of the late Mr. William Webster, the contractor. His father did not take any contract after the year 1882–83, but his business was carried on with a partner until two years ago. That partner was Mr. Staniland, formerly M.P. for Boston. He believed that Mr. Staniland was purely a financial partner. Witness had commenced a business of his own in March last, but he had not the books of his father's business.

Mr. Mark H. Judge, who affirmed, was next examined by the Chairman. He said he was a member of the Paddington Vestry, and happened to be foreman of the coroner's jury at the inquiry into the fire at Whiteley's in 1887. The attention of the jury was directed to the rapid spreading of the fire, and much surprise was expressed as to the extraordinary rapidity with which the fire spread throughout the several buildings. The jury made several recommendations or representations, one of which was "that the serious danger which may result from unscientific construction where ironwork is largely used calls for immediate attention, with a view to such amendment of the Building Act as will secure the requisite supervision." On the occasion of that inquiry, Mr. Saunders, who was the architect of the building, and Mr. Gundry, the District Surveyor, gave evidence. No suggestion was made to the jury either by Mr. Saunders, Mr. Gundry, or Mr. Roche (Mr. Whiteley's solicitor, who was a member of the Board at the time the buildings were erected), that there was any doubt as to their having been carried out in accordance with the requirements of the Building Act. The fire resulted in four deaths. Mr. Judge then gave evidence at some length as to the procedure of the Board and the Vestries under the Metropolis Local Management Acts, 1855 and 1862, and described the steps he had taken with a view to getting an inquiry into the Board's affairs. He attended the Board's own inquiry, and gave what evidence was in his possession as to the Board's improper proceedings in regard to the disposal of land.

We will conclude our summary of the evidence next week.

* For summary of previous evidence see the *Builder*, pp. 8, 44, 66, 83, 103, 124, 161, *ante*; and last volume, pp. 434, 446, 466.

NEW PUBLIC WORKS IN CARLISLE.

DURING the recent Northern District Meeting of the Association of Municipal and Sanitary Engineers and Surveyors, held in Carlisle,* several short papers of practical interest were read by Mr. H. U. McKie, the City Surveyor, describing new public works carried out from his plans and under his superintendence. We make the following extracts from these papers:—

Public Slaughter-houses.

The slaughter-houses were commenced at the end of October, 1886, and opened at the beginning of November, 1887. The area of the site is over an acre. The buildings consist of five separate blocks, viz.:—I. Slaughter-houses and cooling-rooms for cattle and sheep. II. Lairage for cattle and sheep. III. Pig slaughter-house, cooling-room, boiler-house, and tripery. IV. Piggeries. V. Office, stores, fodder-house, meter-house, w.c., and urinal. The total cost of the work, including approaches, drainage, fittings, &c., was 6,101*l.* 19s. 2d.

The pigs have been kept entirely separate from the cattle and sheep, being on the left side of the main entrance roadway. The buildings have been designed so that animals being taken into them never see the slaughtering till they are taken to be slaughtered; the approaches to the different alleys being shut off by large sliding gates, hung on Hatfield's patent pulleys.

With a view of keeping the buildings cool, as much sun has been shut out of them as was possible, considering the aspect they have.

The insides of the slaughter-houses and cooling-rooms are lined, for a height of 6 ft., with white enamelled bricks. The rest of the buildings are of stock bricks, with pressed brick pilasters and arches. The floors are of concrete, in two layers, the bottom one of 1 of cement to 4 of gravel and sand, and the top layer of 1 of cement to 2 of Dalbeattie granite. In the outside floors the bottom layer is 3½ in. thick, and the top layer 1½ in. thick; in the inside floors the bottom layer is 2 in. thick, and the top layer 1 in. thick. The surface is finished rough to give a good foothold.

The offal is collected for removal by means of tubs, which are taken when full on iron two-wheeled carriages to the crane in the main roadway, and hoisted up and emptied into the tumbler cart, and carted away each day by a contractor, who pays 2s. 6d. a ton for it. The carriages and tubs are so arranged that one man can easily load the tubs and tip them into the tumbler cart.

The following is a short description of each block:—

I. Cattle and Sheep Slaughter-house Block.—This block consists of seven slaughter-houses, each 18 ft. by 18 ft., and seven cooling-rooms, 18 ft. by 12 ft. each. There is room to keep the carcases of 12 beasts and 64 sheep in each cooling-room, and 12 more beasts and 36 sheep in each slaughter-house. That is to say, that 168 beasts and 700 sheep can be slaughtered in one day, and the carcases left on the premises to cool. The slaughter-houses are fitted with overhead rails, which run through the slaughter-houses and cooling-rooms, and out under the overhanging roof, which projects 6 ft. into the loading alley; the latter is to enable the carcases to be loaded for the market under cover. The beasts are hung from the overhead rails, and the sheep from side rails fixed to the walls, just above the glazed brickwork.

II. Lairage Block.—To the west, on the opposite side of the slaughter-house alley, each of the slaughter-houses has lairage for cattle and sheep. The byres hold four cattle each, and are 15 ft. 1 in. by 11 ft. 3 in. The sheep-sheds hold 30 sheep each, and are 15 ft. 1 in. by 13 ft.; they are divided down the centre by an iron railing and a water-trough. The doors to these lairs are so arranged that the animals are obliged to go the way they are wanted to. The total number of animals that can be kept in these lairs is 29 cattle and 210 sheep. The Corporation have decided to build an additional byre to hold 16 cattle.

III. Pig Slaughter-house Block.—This block consists of a pig slaughter-house, 30 ft. 6 in. by 30 ft.; a cooling-room, 34 ft. 6 in. by 30 ft.; a boiler-house, 30 ft. by 10 ft.; and a tripery, 30 ft. by 15 ft. The slaughter-house and cooling-room are fitted up with three rows of overhead rails, with three scalding-tubs at the west end, and three large doors, 7 ft. 6 in. wide, at the other end, where the carcases can be loaded for market. These doors are fitted with Attwood's patent rolling shutters. The tubs are heated by steam direct from the boiler; steam is also laid on into the tubs in the tripery. The building is lighted by a glazed portion along the whole length of the centre of the roof, with louvres for ventilation on each side of it. It is also ventilated by means of movable louvres in the north wall. 234 pigs can be hung in the cooling-room, and 102 more in the slaughter-house, making a total of 336, which can be killed in a day and their carcases left to cool.

IV. Piggeries.—The piggeries consist of fourteen separate pigsties, with a raised range and inspection passage down the centre. The feeding-troughs are placed along the front, and the pigs are fed through doors hung so that the troughs can be either shut in or out of the sties. Each piggery will hold 15 pigs, making a total of 210 pigs which can be kept in the piggeries.

V. The Office Block.—This block is situated near the entrance, and consists of a superintendent's office, 15 ft. by 13 ft.; store-room, 15 ft. by 13 ft.; fodder-house, 15 ft. by 20 ft.; meter-house, 8 ft. by 8 ft.; w.c. and urinal. Nearly all the butchers in the city have gone into the slaughter-houses, which are paying their working expenses and the interest on the money borrowed for their construction, though they have only been opened six months. The following are the charges made:—Killing a beast, 1s., calf, 6d., sheep and lambs, 2d., pig, 6d., pig under 56 lb., 3d. Lairage after the first 36 hours—beasts, 3d. a day; pigs, sheep, lambs, and calves, 1d. a day; half these charges are made if the animals are kept in the paddock outside.

Police Office and Cells.

In 1879 the accommodation at the Police Office was found inadequate, there being only two small cells on the lower basement floor, 5 ft. 4 in. by 8 ft., and three cells on the basement floor, 9 ft. by 6 ft. The Chief Constable's office was only 15 ft. by 6 ft. 6 in.; the day-room, 15 ft. by 14 ft.; Committee-room, 24 ft. by 16 ft.; and on the present site there was also the Chief Constable's house, consisting of kitchen, sitting-room, three bedrooms, pantry, and w.c. The Watch Committee requested the author to prepare plans giving extra accommodation, doing away with the old Chief Constable's house, and building a new one, to the north of the Police Office, but not communicating with it. After fully considering the subject and making several sketch-plans for the committee, the author recommended the Watch Committee to gut all the interior walls out except the staircase, and to entirely remodel the interior of the Police Office. The result was to get six cells on the lower basement floor, which is the same level as the ground at the outside of the old City Wall, and level with the drill-ground, nine cells on the basement floor,—in all fifteen more convenient and larger cells than the five old ones.

On the ground floor or level of the west walls and the principal entrance to the Police Office, the day-room was increased to 22 ft. 3 in. by 14 ft. 6 in.; the sergeants' office, 14 ft. 9 in. by 13 ft. 3 in., there being no sergeants' office before; a Chief Constable's office, 14 ft. 9 in. by 13 ft. 3 in.; Committee-room and library for records of patents, 23 ft. 6 in. by 22 ft. 3 in.; passage 6 ft. 6 in. wide, in lieu of the old passage, 4 ft. 6 in. wide. The boiler-house for heating apparatus is on the lower basement floor, and all the cells are heated with 4-in. diameter hot-water pipes.

The ventilators are so arranged that the ventilation of all the cells or any one of them can be manipulated from the day-room without going near the cells, and it can be seen at once how each cell is ventilated from the day-room ventilating regulator and indicator. The passage to the basement cells is lighted by Hayward's patent floor and stall lights.

The whole of the building is well ventilated, and each water-closet soil-pipe has a separate ventilator carried above the roof.

In addition to the Police Office, a new Chief Constable's house was erected, four stories high; it has front and back entrance, the latter entering the drill-ground. The house contains dining-room, 14 ft. 6 in. by 18 ft.; drawing-room, 12 ft. 3 in. by 14 ft.; five good bedrooms; kitchen, 14 ft. by 11 ft.; bathroom, two w.c.'s, lavatory, pantry, scullery, washhouse, storeroom, coal-house, &c. The total cost of the works was 2,620*l.*

Record of House and other Junctions on Main Sewers.

The importance of having a true record of house and other junctions will be patent to all who have been bothered for the want of such a record. The records prevent injury to the sewer, as it need not be cut into, injured, or disturbed by opening, and the private drain connexion with the sewer can be made at the least possible cost of labour and the least interference with the traffic of the streets.

The positions of the junctions have been fixed by taking the distance above or below house-door jambs, window jambs, line of buildings, street corners, and other prominent landmarks, as near as possible to the junction to be recorded.

Mr. McKie also read a paper on "Lazonby Flags," which we printed in the *Builder* for Sept. 1, p. 162.

The Public Baths.

Mr. J. Hepworth, Assoc.-M.Inst.C.E., Engineer of the Carlisle Corporation Gas and Water Works, contributed to the meeting a short description of the baths recently erected by the Corporation of Carlisle. These baths were erected in 1883-4 on a corner site—bounded on two sides by James-street and Wood-street, Victoria Viaduct—previously unoccupied and belonging to the Corporation. The frontages in James-street and Wood-street are 100 ft. and 125 ft. respectively, and the total area is about 1,378 sq. yards.

The building was intended to be simple and unpretentious in character, and is designed in the domestic style of architecture, carried out in red brick, relieved with red-stone dressings and terra-cotta panels, all of local production.

The basement has been fully utilised, and in addition to the space occupied by the swimming-baths, hereafter referred to, ample space has been allotted to a boiler-house, workshops, laundry, and other purposes. In the basement perfect access is obtained to the whole of the exterior sides of the three swimming-baths, and to the whole of the water inlet and outlet pipes, to every bath, and to every drain throughout the building. The subways, or basement floors, are formed of cement concrete.

The ground-floor is approached by a few steps from the principal entrance, James-street. To the left of this entrance, the office and residence of the superintendent are situated, and from the window of this office tickets and towels are supplied to bathers before admission to the entrance-hall.

The entrance-hall forms an important feature of the building. This hall is 20 ft. long by 11 ft. 6 in. broad, and 16 ft. in height, and from it the entrances to all the different sections of the baths radiate. The floor is laid with decorated tiles; round the walls of the hall is carried a panelled and moulded dado of pitch pine; the ceiling cornice, doors, and all the woodwork are also of pitch pine. The upper panels of the vestibule door are glazed in leaded panes, and bear the two coats-of-arms of the City of Carlisle, and the upper panels of the other doors leading from the entrance-hall are glazed with obscured glass with the names of each bath cut thereon.

The baths have been divided into four sections, three of which are completed, viz.:—Section 1, Gentlemen's first-class baths; Section 2, Gentlemen's second-class baths; and Section 3, Ladies' first and second class baths. The fourth section has been reserved for a Turkish bath, which has not yet been constructed. The separate entrance to each section is indicated on the respective doors within the entrance-hall.

The whole of the slipper-baths are of porcelain, and the swimming-baths are constructed of cement concrete.

In Section 1 (gentlemen's first-class baths), situated in the north wing, the entrance corridor divides the slipper-baths from the swimming-bath. There are four slipper-baths—supplied with hot and cold water, with shower attached. Lavatories are fixed in each apartment, and the fittings throughout are of the most modern and complete character. There are also vapour and spray baths. The swimming-bath in this section is approached from the opposite side of the corridor, and is 60 ft. by 30 ft. by 3 ft. 6 in. deep to the water-line at one end, falling to 6 ft. 6 in. at the other. The bath is constructed of cement concrete, the side walls being 2 ft. in thickness, and the floor 12 in. in depth. The bottom is paved with white glazed bricks, with three parallel lines of brown glazed bricks along the entire length for the guidance of divers. The sides are tiled with white glazed tiles bordered at the top with tiles of a pale blue pattern. Steps of masonry lead down into the swimming-bath at each end. Handrails are fixed round

* See *Builder*, *p.* 11, *ante*.

the sides of the bath, and overflows (also used as spittoons) are fixed at convenient distances on the water-line.

The water is run into this bath by a 4-in. main, and also by a spray pipe at the shallow end of the bath. The water in the bath is heated by a supply of steam introduced at the deep end of the bath, and the water is discharged at the outlet into a 12-in diameter pipe leading to the public sewer. The footways round the bath are laid in coloured tiles, with freestone coping.

There are seventeen dressing-boxes arranged round the footway, and the necessary toilet arrangements have been provided throughout.

The dimensions of this apartment are 72 ft. long by 39 ft. broad, and the walls rise to a height of 14 ft., being worked in panels. The dado, mouldings, and pilasters are in red brick, and the panels in buff, relieved by a cornice of terra-cotta bricks. Running along the greater length of this wing is a lantern light in the roof of this building, which serves the double purpose of giving light and ventilation. The roof is constructed of light ironwork.

As adjuncts to the swimming-bath there are a foot-bath, with shower-bath attached, a lavatory, urinal, diving-stage, and a drinking-fountain of Doulton ware.

In Section 2 (gentlemen's second class baths), situated in the south wing, 75 ft. long by 57 ft. broad, there are seven slipper-baths, also a vapour and a spray bath. The swimming-bath is 65 ft. by 30 ft., and the depth of water is the same as in the first class, and as the bath is constructed, lighted, and ventilated in the same manner, no further reference to it is necessary. In this section twenty-eight dressing-boxes have been provided on the north and south sides of the bath. Above the dressing-boxes, balconies with balustrade and seats are provided for the use of spectators on the occasion of a swimming entertainment or competition. The balconies are approached by a stairway leading from the footway, and a foot-bath, shower-bath, fountain, and the necessary adjuncts have been provided as in Section 1.

Section 3 includes the ladies' baths, subdivided into first class and second class. Within the entrance to this section a ladies' waiting-room has been provided, and a corridor leads to the various baths. There are four slipper-baths, one Roman, one vapour, one spray, and three shower baths. A swimming-bath 29 ft. by 16 ft., with a depth of water from 3 ft. to 5 ft., seven dressing-boxes, a foot-bath, and the usual adjuncts, furnishings, and toilet arrangements complete this section.

Section 4 is reserved for a Turkish bath if required.

The swimming baths and most of the slipper baths are lighted from the various roofs, the remainder from windows in the front of the building. The arrangements for lighting the swimming baths in the evening are by gasaliers of wrought iron. The arrangements for heating the building are as complete as possible in every respect. Hot-water pipes are laid throughout the whole building, those in the swimming and slipper baths being of 3 in. diameter, and laid through the dressing-boxes; while the entrance hall is heated by a coil of pipes.

Ventilators on the Tobin principle have been fixed in the several swimming apartments, and these, with movable openings in the lantern lights, constitute the provision for ventilation.

An abundant supply of pure water is obtained from the public mains, from which a 4-in. main has been laid into the building; the water used is measured through a 4-in. water-meter, but is now provided free of charge by the Urban Sanitary Authority.

Two Cornish boilers, 16 ft. 6 in. long by 5 ft., and a water superheater, fixed in the basement story, have been found necessary for heating the water supplied to the slipper baths, and for providing the requisite steam supplied to the swimming baths, vapour baths, and laundry. The swimming baths are kept at a tepid temperature throughout the year. A chimney 100 ft. high stands in the rear of the boilers.

The laundry is supplied with Bradford's apparatus, including washing-boiler, washing-troughs, washing-machine, wringer, wrinser, soap-boiler, clothes-bins, hydro-extractor, and drying-closet, fitted with six sets of travelling horses running on castors. Steam has been utilised for all laundry purposes, and a small engine of two-horse power drives all the machinery. There are entrances to the laundry and boiler-house from Wood-street.

The entire cost of the building, baths, and furnishings was £7,000, and was provided from the profits of the Gas Works, specially appropriated for the purpose from the City Fund, and the Engineer of the Gas and Water Works was employed as the engineer and architect for the baths, and was assisted by Mr. H. Higginson, Carlisle, then a member of his staff.

The baths were erected to meet a pressing want in the City, and for this purpose the tariff of charges was fixed at a low rate. That this want has been met is abundantly evident in the appreciation and support which is regularly accorded to the baths.

The Main Roofs of the Corporation Markets.

Mr. Arthur T. Walmisley, M. Inst. C.E., read a paper describing the central main roofs of the new Carlisle Corporation Markets. He said that the new Market roofs now in course of construction in the City of Carlisle cover an area of about 6,300 square yards, exclusive of surrounding arcades, shops, and offices which are connected with the market buildings. A length of about 197 ft. 6 in. by about 211 ft. 6 in. in width, forming an area of about 417 squares (of 100 superficial feet), is roofed over in three equal spans of 70 ft. 6 in. each, supported by walls at Scotch-street and New-street sides, and by twelve intermediate columns, set out at distances of about 39 ft. 6 in. apart, parallel to these streets. The central span of 70 ft. 6 in. is carried round at an angle towards Fisher-street, so as to enter this thoroughfare nearly at right angles. This length is about 76 ft., and is enclosed upon one side by existing buildings, and upon the other side partly by a fish market covering 2,370 square feet, or say 24 squares, and partly by a three-cornered roof of 600 square feet.

The main ribs of the roof covering the general market are of the braced arch type, consisting of a rigid wrought-iron rib 13 in. deep in the centre, having a curved outer surface struck with a radius of 44 ft. 6in., and forming a truss connected by round bar-iron ties having screw adjustments, the total depth from the back of the rib at the centre to the springing line being 18 ft. 9 in., and to the horizontal tie 11 ft. 6 in., which horizontal tie is placed 7 ft. 3 in. above the springing line. The soffit to the curved member of the truss is struck with three radii of 41 ft. 6 in., 58 ft., and 11 ft. 6 in. respectively, the depth of the arched portion near the springing being 18 in. The flanges consist of two $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$-in. angle irons, united vertically with a $\frac{3}{8}$-inch web plate. The round bars in the ties are of scantlings varying in diameter from $1\frac{3}{4}$ in. to $2\frac{3}{4}$ in., and in order to secure a proper connexion between the inclined tie-rods and the segmental rib at the springing, the feet of the principals at the junction of the rods are spread out laterally, the webs doubled, and the tie-rods united to the curved member by pins of 4 in. diameter.

Owing to the unsymmetrical form of the plan of the roof, necessitated by the shape of the ground available for market buildings, special ribs were required in some parts of the design. Thus a special intersection rib had to be designed to be fixed at the junction of the central span with the continuation of that span towards Fisher-street; and at the end of the side span adjoining New-street, where it abuts against the fish market, special hipped ribs were introduced; but the whole of the ribs were designed so as to preserve harmony throughout, and to maintain a uniformity in the general appearance.

In order to avoid as little interference as possible with the space of the market, the number of columns was minimised by carrying alternate main ribs upon spandrel girders of 38 ft. span, 4 ft. deep at the ends, diminishing to 3 ft. deep at the centre. These girders are fixed between the heads of the columns at a uniform level throughout, but owing to the levels of the adjacent streets, and in order to avoid the great inconvenience of steps to a market, the floor is made to slope towards one end, and consequently the height of the columns varies with the gradient of the market floor. The columns are of cast iron, 18 in. diameter, $1\frac{1}{2}$ in. metal, with brackets cast on, above the capitals, to suit the design of the main ribs. They average 28 ft. in length, and are to be noticed as a successful adoption of an octagonal body developing into a square head and base instead of the stereotyped circular form. The lateral force of the wind upon the roof is transmitted through the main ribs to the columns, and the columns are rigidly fixed so as to provide the necessary reaction to resist it. By these means the side walls are left to take only their own wind pressure, and such portions as are communicated to them by any wind pressure which the columns may not take; but as nearly the whole of the horizontal force from the roof ultimately becomes transmitted to the columns, the eleven columns which come between Scotch-street and New-street had to be designed to resist this pressure. To provide a base sufficiently strong for this purpose, and also to facilitate the fixing of the columns, as well as the drainage of the roof, the bases were cast separate from the columns, the faces at the horizontal joints being planed and securely fixed by eight $1\frac{1}{2}$ in. bolts at erection. The bases, which are 4 ft. 9 in. square, are each firmly bolted down by four $2\frac{1}{4}$ in. diameter anchor bolts, bedded and firmly secured to a cast-iron anchor plate, fixed in and below a mass of Portland cement concrete, 10 ft. 6 in. square and 6 ft. thick. The rain-water from the gutters between the spans is conveyed down the column by wrought-iron tubes 6 in. diameter of 16 B.W.G. plate, between which and the internal faces of the columns concrete is firmly packed, adding weight to the foundation, and forming a permanent protection to the columns from oxidation, by the continual passage of surface water.

The main purlins, which are carried by the main ribs, are 19 ft. 9 in. long, and are of lattice construction, with parallel flanges, each flange being made up of two $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. L.I. Intermediate ribs are carried between the centres of the main purlins. They are also of the parallel lattice type, and are struck from the same centres as the arched portion of the main ribs. Between each main purlin, intermediate or secondary purlins will be fixed so as to divide the roof into convenient dimensions, transversely as well as longitudinally, for boarding and glazing. The secondary purlins are of a fish-bellied lattice type, 9 ft. $10\frac{1}{2}$ in. long, with a depth of 12 in. under the boarded and slated portion of the roof, and 9 in. under the glazed portion. The glazing-bar to be used is known as "T. W. Helliwell's King's Cross bar." Helliwell's system has been employed by the author in the large roof over Olympia at Kensington, and has also (the author is informed) been used in Carlisle in the roof connected with the Corporation Baths. Each span of the roof will be surmounted by a skylight carried by central ornamental trusses, 22 ft. span, placed 9 ft. $10\frac{1}{2}$ in. apart. Between the skylight and the curved roof, vertical louvre frames are provided, filled in with wrought-iron louvres. The lower portion of the curved roof, and also the lower portions of the skylights, are to be covered with slates on $1\frac{1}{4}$ in. boarding, and the remaining portions are to be glazed.

The three spans of the roof at the West Tower-street end of the general market rise above the buildings, and are, therefore, to be closed in with gable screens of a special design, suited to the character of the building. Two of these screens are complete segments, but the third is cut into by the tower at the New-street corner, necessitating a modification of the detail in the half span. In the design of these screens the author has avoided the heavy parallel members usual in screens for large roofs, and has introduced vertical triangular trusses, having their bases connected to a horizontal bowstring-shaped girder. This horizontal girder is 4 ft. deep in the centre, and is trussed upon the inside so as to obtain lateral stiffness at the support of the vertical trusses. It not only acts as a tie to the feet of the screen rib, but supports a lead flat upon the outside about 14 ft. in width. In resisting the lateral pressure of the wind upon the screen, the glazing is prevented from being blown in by horizontal angle irons, supporting at intervals the glazing-bars, and fixed to the vertical trusses placed 7 ft. 1 in. apart, which act as ties to hold up the horizontal girder. These vertical trusses having at their base the same depth as the ordinates of the fish-bellied horizontal truss, which is fixed at the level of the springing of the main principals, gradually taper off as they approach the end arched rib, and thus the effective depth of the screen varies with the stress, increasing from the outer surface towards the centre of the lower portion, where the stress is greatest. In the side span adjoining New-street, under the hipped ribs of the general market roof adjacent to the fish-market, a special form of transverse truss is adopted, the whole being rigidly connected together, so as to avoid trussing the ridge longitudinally.

The central span of the roof is considered to need no diagonal wind bracing, but the side spans are thoroughly braced diagonally with 3 in. by $\frac{3}{8}$ in. bars.

The roofs over the fish-market and the three-cornered piece of ground adjoining it (previously alluded to) are to be roofed over with principals formed of straight inclined trusses, with vertical members intersecting one another to suit the design. Details of the ironwork for the above roofs will be found in plates 40 and 41 of "Iron Roofs" (second edition), published by Messrs. E. & F. N. Spon.

The total quantity of wrought-iron to be used in the main roofs and fish-market is estimated at 400 tons, and of cast-iron, 130 tons. The weight per square of area covered will equal 15 cwt., including gable-screens, girders, &c. The weight of cast-iron per square, including columns, &c., will equal 5 cwt.

The ironwork has been designed by the author for the architects engaged by the Corporation of Carlisle, Mr. Arthur Cawston, of Queen Anne's-gate, Westminster, and Mr. Joseph Graham, jun., of Fisher-street, Carlisle. Mr. H. C. Charlton is the clerk of works at Carlisle, and Messrs. Corderoy & Selby, of Westminster, are the quantity surveyors.

It is hoped that the architects' desire to economise space and cause a minimum amount of obstruction to traffic by the use of as small a number of columns as was consistent with a suitable design, as well as the avoidance of steps leading to and from the market, will meet with the approbation of the members of the Association of Municipal and Sanitary Engineers and Surveyors.*

[An appendix to the paper contained a summary of the calculations of the stresses in the roof principals; and a brief account of the discussion which followed the reading of the paper was given on page 11 of the current volume of the *Builder*.]

WOODEN STRUCTURES AND THE BUILDING ACT.

ERECTIONS AT "OLYMPIA."

AT the Hammersmith Police-court, last week, Mr. Paget had in his list of summonses several in respect of the wooden buildings erected in the grounds of the Irish Exhibition at "Olympia," Kensington, without a licence from the Metropolitan Board of Works.

The case against Mr. John Henry Raffety, in respect of the arena or grand stand, was first taken. Mr. Wontner said in May last the arena and other buildings were commenced to be erected, and Mr. Knightley, the District Surveyor, wrote to the various parties who have charge of them, giving notice that they had no right to erect them without a licence. He saw Mr. Raffety, who was one of the Executive Council, and told him that a licence was necessary. Mr. Raffety sent for the architect, and gave him instructions to apply for a licence. An informal application was made, but the buildings were erected, and had been in occupation ever since. A fresh application had been made since the issue of the summonses, but the Board had broken up, and a licence could not be granted until Oct. 6.

In the next case, Mr. Henry Etherington was summoned in respect of the Switchback Railway.

There was a third case against Mr. George Baker, who erected the Irish Village.

Mr. Paget, in dealing with the cases, imposed a penalty of 40s. upon Mr. Raffety, and 10s. upon each of the others, remarking that substantially application had been made for the licence. On application being made for costs, Mr. Paget said he thought the summonses should have been taken out sooner.

Mr. Knightley said he exhausted every form of entreaty before applying for the summonses.

Ultimately, Mr. Paget granted two guineas costs in the case of Mr. Raffety, and one guinea in each of the others.

THE SWITCHBACK RAILWAY AT THE CRYSTAL PALACE.

THOMPSON'S Patent Gravity Switchback Railway Company, Limited, were summoned before Mr. Biron, Q.C., at the Lambeth Police-court, on Monday last, by the Metropolitan Board of Works, for having erected this structure without first obtaining their consent.

Mr. Chilvers, from the Solicitors' Department, represented the Board, and stated that the summons was taken out under Section 13 of 45 Vic., cap. 14, by which it was necessary for the defendants to obtain the Board's consent before erecting the structure. This they had failed to do, the Board having refused an application made on their behalf; but, notwithstanding this, the defendants had kept the structure up since May 21 last.

Mr. Percival, a surveyor in the office of the Board, and Mr. George Elkington, junr., the District Surveyor, were called to prove the erection of the structure.

In reply to the magistrate, Mr. Sams, the managing director of the Company, said they were quite willing to do anything the Board required. but they could not ascertain what it was they wanted done.

Mr. Biron said the question before him was whether the structure had been erected without the consent of the Board, and of that there appeared to be no doubt. He must, therefore, fine the defendants 2*l.*, and upon application, he also allowed 2*l.* 4s. for costs.

ACTION AGAINST A LOCAL BOARD.

MR. W. J. BEADEL, sitting as arbitrator, has lately heard the case of Bradshaw *v.* Cheshunt Local Board at the Surveyors' Institution.

Mr. Bradshaw claimed damage in consequence of a sewer for the discharge of waste water having been laid across the land of the plaintiff in Duck's Foot-lane, Ponder's End. The land could not be used as building land where the sewer crossed; hence the action.

Mr. Terrell, barrister, appeared for the plaintiff, and Messrs. R. Cook, Henry Lovegrove, and J. T. Newman were called to give evidence.

Mr. Firth, M.P., was counsel for the Local Board, and called Mr. E. Tewson and the Surveyor to the Local Board.

Award for plaintiff, £64. 12s. 6d.

THE WALLACE STATUE, ABERDEEN.

SIR,—My attention has been drawn to an illustration in the *Builder* of August 11 of a statue of Wallace recently set up at Aberdeen. Wallace was a remarkable man; and it is fitting that some of the descendants of his countrymen who fought under him at Stirling in 1297, and forsook him at Falkirk in the following year, should pay him honour, however tardily. Wallace was executed in 1305. He was, before all things, a soldier, and is, very properly, represented in his statue in armour. We will now see what care has been taken in the conception of the new figure at Aberdeen. But first as to what was the usual equipment of a soldier at the latter end of the reign of Edward I. He wore a gambeson, chausses, a sleeved and gloved hauberk, and a coif of mail; a long surcote, a cingulum, a sword-belt with the scabbard attached to it containing a sword, and prick spurs. This was the well-known harness of English knights of the time of Edward I., but it is by no means certain that Wallace wore such a costume. The defensive armour of nobles and leaders in Scotland was very much simpler, and consisted chiefly of an iron head-piece and a light haketon, but, according to the old song, the Highlanders, previous to the fourteenth century—

> "Had only got the belted plaid,
> While they [the Lowlanders] were mail-clad men."

But let us assume, for the sake of convenience, that Wallace was completely armed after the English manner, and proceed to analyse the details of the statue under consideration. The gambeson was a thick body-garment without sleeves, formed of two thicknesses of linen, stuffed with cotton, quilted in parallel upright folds, reaching more than half-way down the thighs, cut level at the bottom edge, and slit up in front a few inches. The statue exhibits a thin skirt, apparently of metal plates, with a Vandyked edge, arranged like the lambrequins of a Roman lorica; but they are joined together, and it would be interesting to know what sort of Mediæval garment and material this is intended to represent. Long before the time of Wallace, experience had shown that, in order to retain the mail chausses in position at the knees, it was necessary to confine them at these points. This was first effected by running a lace through the rings at intervals, and tying it, and later by buckling a strap round. At the time of Wallace these ligaments had been discarded for complete knee-bands of leather, or caps of iron, which had a better result in steadying the chausses and relieving the knees from the weight of mail. Armourers of all periods were nothing if not practical, and we may depend upon it that, if Wallace wore the fashionable English harness, he would have had the most practicable form of it that could be got. The statue shows the legs encased in mail, which is represented as fitting so closely and in such a way that the mail chausses of a standing figure could never have allowed without the tightening bands, or caps at the knees, which have been omitted in the statue. With regard to the hauberk in the figure, it is at least 15 in. shorter than it should be for Wallace's time, and lacks the almost invariable feature of hauberks of his period, the opening, or slit, at the bottom in front, and the hood or coif of mail at the top, either continuous with the hauberk, or as a separate headgear which could be thrown off, to lie in folds upon the neck and shoulders. The sleeves end at the wrists, without the gloves or mufflers which should have formed part of them; nor are there straps at the wrists, either of which details were almost indispensable to prevent the mail sleeves from running up the arms when they were in action, and both of which were constantly used together. It was the fashion in earlier times for the surcote to reach far below the knees, and often nearly to the feet, in Wallace's day. It reached to such a length at last that men called upon suddenly to fight on foot got their legs entangled in the surcote's folds, and fell an easy prey to the enemy. The statue, having both gambeson and hauberk too short, shows the surcote much too short also, and, apparently to remedy this defect, we find Wallace decked with a Roman *paludamentum*, a proper enough attribute for a Latin emperor going to war, but not exactly appropriate for a Scottish chieftain. The cingulum shown round the waist is wider than those worn by late thirteenth and early fourteenth century knights, who had them specially narrow for coolness; the long slack end hung loose, and was never tucked under the belt, as shown in the statue, for the same reason. It is well known that the surcote was a light vestment, usually made of silk, and sometimes embroidered with armorial bearings. It was merely to protect the mail from the rain, and ward off the sun's rays. It is therefore somewhat startling to find that Wallace is shown in his statue wearing a horn suspended from a twisted cord, of which the front end is fastened into nothing firmer than the delicate material of the surcote, and in a way that no horn was ever worn. Whether the shape of the horn shown is more proper for drinking than for blowing may, perhaps, be left to musicians to determine; but it is extremely improbable that Wallace, as a chieftain, ever carried a horn for either purpose. It never was an item in the military accoutrements of a knight, and the few effigies which exhibit this feature are either foresters, like Junk Wyrall, at Newland, in the Forest of Dean, with his horn slung in a belt, or the knight at Pershore with a horn in his hand. This is supposed to indicate that he held his lands by cornage tenure or horn-geld. I have already intimated my doubts whether Wallace wore full armour, after the English fashion; it is open to question whether he was entitled to use armorial bearings, and it is quite certain that if he ever bore "gules, a lion rampant azure, within a bordure, compony of the last and azure,"—the azure of the border was not indicated on his shield by horizontal lines, after the engravers' fashion which was first introduced into this country from Italy in the middle of the seventeenth century. That so warlike a man should have at his feet so puny a heater shield is entirely at variance with what we know to have been the fashion of the time; indeed, it would have been an appropriate concession if in his statue Wallace had carried the ancient Scottish shield, the circular targe, that had come down from Roman times and never died out in Scotland as long as armour was worn there. As the sword is the most important feature in the equipment of a warrior, so it unfortunately happens that this is the most inaccurate item of all the inaccuracies which the statue of Wallace exhibits. The great two-hand sword

* Since this paper was in type, we learn that good progress continues to be made with the various contracts at the new public markets. "At present, it is true (says the *Carlisle Journal*) that, owing to the active condition of the building trade generally, the number of masons actually at work is only about forty-five as compared with about seventy or eighty some time ago; but the mason work is so very much in advance of the iron work that the general progress of the market buildings is not at present being affected by the lack of masons. In fact, the rapidity with which the stone work has been carried on has nearly exhausted the supplies at some of the local quarries, and the contractors have had to go further afield for stone. A large quantity has been obtained from the Hayton quarry, which has been re-opened by Dr. Hodgson, of Aspatria. Hayton has the reputation of being one of the best red sandstone beds in Cumberland. Records are said to be in existence showing that the stone used so far back as 235 years ago is as good yet as when it was taken from the quarry; and the perfect condition of the stone work of Aspatria church, built fifty years ago, is a strong proof of the quality of the material. The springers of the main doorways of the market, together with the arch stones, have been formed from the Hayton stone, its homogeneous nature rendering it suitable for good permanent work of that description. . . . . Consequent upon the change in the iron contract, Mr. Walmisley, the engineer of the roof, has visited the market. Messrs. Cowans, Sheldon, & Co., the new contractors, have commenced with the fixing of the wall brackets for the principals at the new street side of the market. . . . . The work of putting up the iron roof over the arcade in Scotch-street, together with the iron girders, is now in progress."

was distinctly a fifteenth-century Swiss weapon. It was not introduced into England before the first quarter of that century, and fell into disuse on the death of Henry VIII. It appears to have been highly esteemed in Scotland, where several examples are preserved. There is one, imagined to have been used by Robert Bruce at Bannockburn (1314); another, at Drummond Castle, is said to have been used by Lundin at the same battle; another, at Cluny Castle, with almost precisely the same details, seems to have been taken as the model for the sword of Wallace. There are several in the Tower, some of which are merely for processional purposes. The sword carried by Wallace in his statue is, therefore, nothing but a fifteenth-century weapon, such as he could never have seen. Placed in an upright position the pomel reaches higher than the armpit, and it would have been physically impossible to draw it from the scabbard, which is out of our view in the statue, but from which we must assume Wallace has managed to extract it, inasmuch as a sword belt is shown for its support across the hips, in the position usual at his time. I am, therefore, driven to the conclusion that the Aberdeen statue does not represent with any degree of accuracy either an English or a Scotch soldier of Wallace's period, but that it is a mere fanciful equipment of which the details range from Roman times to the Wars of the Roses. This is greatly to be regretted, and there is the less excuse for it, because the subject of armour, weapons, and dress has been so closely studied of late years that Scotchmen were justified in expecting that, if they could not get a portrait-figure of one of their greatest men, at least they would have something approaching to a faithful representation of him "in his habits as he lived." Making every allowance for the exigencies of sculpture,—for what I believe is called "the sculpturesque,"—this thought arises, what a picturesque and sculpturesque figure might have been produced, whether the man had been shown in the wildness and freedom of his own country's garb, or in the more dignified panoply of the soldiers of the nation against whom he fought so well. In either case, with all our knowledge, we might at least, without let or difficulty, have had *truth*, and Scotchmen, and particularly Scotch antiquaries, could have pointed with satisfaction, if not with pride, to the figure of the illustrious patriot, instead of passing it, as many must now do, with a shrug, or even a shudder.

ALBERT HARTSHORNE.

August 29, 1888.

ANCIENT INSCRIPTION AT KENDAL.

SIR,—During the removal of a house to improve the west approach to the new bridge at Appleby, a stone, with the following partly-obliterated inscription, was found:—

"Esto porta potens nulli ——— oto."

The Rev. Canon Matthews, of Appleby, suggests that the blank has been filled in with "proprio nisi v(oto)"; and Mr. Bell, of the same place, thinks it possible the missing-link may have been "custode rem(oto)."

No record can be obtained as to the date of the erection of the bridge, nor has any data been discovered in its removal to enlighten us, but I am of opinion the structure is very ancient, and my theory has always been that it was originally the gate-bridge to Appleby Castle, and Mr. Bell's filling-in of the blank space would seem to rather favour this view; but, on the other hand, there is authentic record that in ages past there was a chapel over the bridge, and it may well be, therefore, that the blank was filled in by words meaning "that no one should the gate be opened to except those who properly attended to their vows."

Perhaps some of the archæological or antiquarian readers of the *Builder* may be able and willing to exercise themselves in solving the problem.

Kendal, August 25. JOSEPH BINTLEY.

ARCHES, NAVE TRIFORIUM, BEVERLEY MINSTER.

SIR,—Very recently the Vicar of Beverley Minster found in the triforium of the nave (both north and south sides) several round-headed arches, some having the zigzag ornament.

The Vicar, when pointing them out, told me there was a difference of opinion as to whether they, with some of their surroundings, form a part of the earlier church, or are materials rebuilt.

The following seem to me to point to but one conclusion:—

The zigzag ornament does not run uninterruptedly from one voussoir to another, though the soffit is even. This is to some extent not unusual; but here the difference is frequently as much as several inches. The same ornament in some cases comes down below the impost, in others finishes higher by several feet, and this, too, at times in the same arch.

Were these arches an undisturbed part of the earlier church the columns should be of greater bulk; here they appear too slender to contain the core of Norman work. HENRY LITTLEHALES.

Bexley Heath, Sept. 1.

THE BASSET MOTTO.

SIR, — Your correspondent, "Griffith," [p. 144, *ante*] has, seemingly, mistaken the main reason for the agitation to change this motto as it figured on the badges of the Welsh (41st) regiment. The main error was in the use of a word, *augau*, which has no existence in the Welsh language, for *angeu*, not in the smaller mistake of "neu" for "na."

Your citation of the words as they stand at Beauprè supports the philologist in this. As Horne Tooke said: "Letters, like soldiers, are apt to desert and drop off in a long march," and contraction is evidently responsible for the change from "angury" to "angeu." It will soon stand correctly on the regiments' appointments, I presume, proud in the triumph of its contention, "Qwell angeu na chywilydd." BERT HARRIS.

PROPOSED PUBLIC LIBRARY, &c., NEWTON HEATH.

SIR,—I should like to call attention to the "Conditions of Competition and Instructions to Architects," drawn up by the Newton Heath Local Board of Health. If the Manchester architects are caught by such a bait as this they must be even more in want of work than we are in London.

When each condition is so charmingly reasonable and generous, it is difficult to point to any one particularly worthy of notice. You will observe, however, the amount of work required in the preliminary competition (practically a complete set of working drawings), and that after making two such sets, the successful competitor may be rewarded with the handsome sum of 50*l.*! The idea, also, of the successful man being obliged to provide the premiums for the unsuccessful competitors is new to us in London; as is also the honour of being associated with the Engineer to the Local Board in carrying out the work. It would appear that the Board also expect the builder to work as cheaply as the architect who may be so fortunate as to be selected by them, for they require Public Library, Science and Art Schools, extension of Public Offices, Assembly Rooms, and Public Baths to be built for 8,000*l.* A Clock Tower to be included "if the funds permit."

ED. W. MOUNTFORD.

London, Sept. 5.

"CEMENT FINISHING FOR PAINTING."

SIR,—In reply to "An Architect" [p. 163], it would be better to discard Portland altogether, and only have one cement,—viz., Keene's,—as, until the Portland is thoroughly dry, it is almost sure to create an efflorescence through whatever material may be put upon it, whether another cement or only paint. It is not at all wise to paint over Portland till eighteen months after plastering. If the work is in progress, or must be done in the way stated, then, as a precaution, paint only one coat of B.O. and red lead mixed with white zinc paint as a priming, and let it stand so for eighteen months. If then there is no efflorescence, it will be safe to do anything; but not until that time. W. B. DEVERILL.

FLOORING.

SIR,—If "Boaz" [p. 163] had filled up the space under the floor with good rubbish, well rammed, to within 6 in. of the finished floor level, and on the top of that had first put 3 in. of Portland cement concrete and then 2 in. of coke breeze concrete, he could have nailed the floor-boards directly down to the latter without having any joists at all, and he would have saved thirty shillings per square at least. The coke breeze concrete, which is composed of 4 parts of coke breeze to 1 of Portland cement, should be well mixed, first in a dry state, and then water gradually added till it is quite sloppy, because the coke breeze absorbs a great quantity of water. Strips of wood, ¾ in. by 2 in., should be placed on edge at intervals of 6 ft. or 8 ft., to form screeds to get a level surface.

The coke breeze should be left at least three weeks before the boards are nailed down. I am surprised that this kind of flooring has not become universal by this time, but apprehend that architects are not aware that it is so much cheaper than sleeper walls, plates, and joists; they surely must know that it is very much better.

CHARLES F. MOXON.

CHIMNEY-POTS.

SIR,—With reference to the letter of "C. J." [p. 144, *ante*] respecting metal caps upon chimney-shafts, I quite agree with you that there can be no valid reason for using them. It has also occurred to me that there can also be no reason for the use of chimney-pots. To my mind, the effect of many a good building has been marred by them, while any advantage supposed to be derived by the extra draught could as well be attained by raising the shaft to the same elevation, and then finishing it in an ornamental manner. Perhaps some of your readers may throw some light on this matter. W. G. L.

The Student's Column.

ARTIFICIAL STONES.—X.

Concretes.

THAT special class of artificial stones termed "Concretes" is usually understood to represent various mixtures of lime, cement, coarse gravel, pebbles, and sand, incorporated with water. A few brief remarks must suffice for this section of our subject, as it has been already frequently and fully discussed in the columns of this and other technical journals, and in papers read before various learned societies.

One of the earliest English patents for concrete was that taken out in 1810 by J. Kent, who directed that powdered quicklime should be mixed with fine sand (or any material of which any kind of stone is formed in a natural way); after these have been intimately incorporated, coarse sand or gravel is added with just water enough to enable these materials to be very powerfully rammed or pressed together in moulds of desired form; the stones are finally put under cover, and in the open air to season. Powerful ramming, trituration, or violent concussion of the concrete mixtures, is an essential part of the procedure required to enable many of them to be successfully applied. Vitruvius recommended that mortar should be well beaten with wooden staves before being used. J. Gibbs, in 1850, stated that, in proportion to the force applied to it in pounding so will the cement become indurated after setting; he therefore recommended that artificial stone formed of any water cement, mixed or not with limestone, should be powdered strongly in a mortar with water, or as an alternative plan to place the mixture in moulds which are elevated, and allowed to fall repeatedly. The concussion so produced will cause the block or the article to become so consolidated that, if a good cement has been used, it will, after standing for a short time, become equal in hardness to freestone.

A point of some importance, which is remarked on by Mr. H. Reid in his well-known treatise on concrete, is, that although ramming improves most cement mixtures, an exception must be made in the case of those containing Roman cement, as the operation in this case would seriously disturb the indurating action which speedily sets in.

The secret of good concrete is a very open one, and lies in the quality of the mortar used. It is a good old saying that "a silk purse cannot be made from a sow's ear," and equally true is it that reliable concrete or artificial stone cannot be made by "chucking" together any dirt, rubbish, stone, and cement without regard to the proportion or the compatibility of the ingredients. The late Mr. I'Anson, referring to this subject in the columns of this journal nearly twenty years since, said very truly, "that the success of such work (*i.e.*, concrete building) depends upon the entire honesty of the man who does it"; we would add, after the word honesty, the further qualification of intelligence, for many an honest worker has turned out worthless work through sheer ignorance of the principles to be borne in mind. The proportion of lime or cement to be mixed with the stones and sand is another matter to be carefully considered, too much or too little of either class of ingredients greatly reducing the durability of the product, the perfection of proportion, according to Mr. C. H. Smith, being reached when each particle of sand is covered with lime to about the thickness of an ordinary coat of paint, and in this country one of the most approved mixtures is one of good lime to three of sand. The degree of fineness of the sand is of some consequence; if it is too fine, the individual grains do not get well coated with lime, and if too large, interstices unfilled with

cement result, weakening the product. If water-worn pebbles are used they should be mixed with pure sand, and, if possible, roughly broken up so as to present as many angles as possible, and so permit of the formation of a more highly compacted mass. The use of rammers in consolidating the concrete after it has been placed *in situ* is efficacious, owing to the more thorough contact of the lime or cement with the grains of sand, particles of flint, gravel, &c., and the consequent filling up of interstices and expulsion of air which result. The reason for desiring so thorough a contact of the lime with the siliceous matter is that a portion of the cementing effect is due to the formation of a superficial coating of silicate of lime. In order to ensure this union of lime and silica, Fernikoff exposes equal parts of lime and sand to a temperature of 150° C. for several hours in presence of steam, and the material is then pressed, moulded, and exposed to the air for several weeks.

Glazer used in his process a much larger proportion of sand, 4 to 6 parts being mixed with 1 of slaked lime, and then exposed to a high temperature, under a pressure of three atmospheres, and finally pressed into moulds.

Headley's artificial granites and marbles (1856, patent 2,956) were formed of good clean sand, fine gravel, or other pulverable siliceous matter, with sufficient fat lime, well mixed together. The natural dampness of the gravel will slake the lime, "which, heating, will unite superficially with each grain of sand." When the compound has become cold it is to be moistened with sufficient water to enable its particles to pack together. This is to form the interior or hard basis of the stone, the surface being covered with a smoother and more ornamental composition made from granulated marble and unslaked lime. Mineral oxides, &c., may be added to give colour, and if extra hardness and polish be desired the blocks should be saturated for a few hours in a solution of water glass at a temperature of 300° F.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

12,857, Ventilator. H. Waddington.

This invention consists in placing inclined boards or louvres in a ventilating-shaft or trunk in such position that, while there is sufficient passage for air, steam, or smoke, they will at the same time prevent any rain getting into the room over which the ventilator is fixed.

13,127, Butt-hinge and Fixing. A. Stephenson.

It is claimed that the hinge which is the subject of this patent not only answers the purpose of hanging a door, but, on the door being opened, such hinge causes the door to rise for the purpose of clearing the carpet. It also closes the door automatically after it has been opened. The pin on which the hinge moves is placed off one side of the line of hinge-plates. By this means the door is raised higher or lower in proportion as the hinges are placed farther from their ordinary position. The hinges may be used alone or in combination with those of the ordinary kind.

13,258, Revolving Door Post. W. H. Dutton.

This invention consists of a post on each side of the door, the said post being made round, or of similar form, and fixed on spindles affixed to the sill and lintel of the door-frame. These revolving posts are to be used at the corners of staircases or passages to facilitate crowds passing in and out of public buildings.

6,023, Sash-fasteners. J. Trinick.

The object of this invention is to provide a sash-fastener by which both sashes may be locked, or one sash may be locked and the other be left free to open a certain distance, or both may be free to open a certain distance for ventilation, or free to open fully for cleaning, the fastener being arranged so that it cannot be seen or opened from the outside. The fastener is let into the pulley-stile or the side frame of the window in line with the meeting-bars of the two sashes, and it consists of a plate by which it is screwed to the side frame. At the back of this plate is a slide, secured to the plate by straps, and formed with two lateral catches or studs, which project through the plate and into recesses at the side of the sashes. The slide is connected with a suitable handle, by which it may be pulled out or pushed in as required, means being provided to secure it temporarily in either position.

9,234, Bolts for Doors, &c. J. H. Cartland.

According to this invention, the staple ends of the bolts and their barrels or sockets are made in cross sectional form, having a close "necked-in" form for ease in manufacture.

9,560, Mortar-mills or Edge-runners. W. Eddington.

The mortar-mills which are the subject of this patent are made readily portable by mounting the mill on a base frame, which may be raised off the ground and supported on wheels for travelling, the frame being provided with gear for raising and lowering the mill when required.

9,656, Water-closets. A. Elmendorf and others.

The idea of this invention is to ventilate the air-space in the basin through a pipe connected to it at one end and with the stand-pipe at the other end. The pipe is filled with water for flushing the basin, and takes the place of the tank or reservoir in general use. The invention consists in the combination of a three-way cock and special valves so arranged that the falling of a column of water in flushing draws after it the foul air, while the refilling of the stand-pipe forces the same through an outlet.

NEW APPLICATIONS FOR PATENTS.

Aug. 24.—12,225, K. Bernhard, Safety Contrivance for Windows.

Aug. 25.—12,258, T. Whittaker, Hinges for Folding-doors, &c.

Aug. 27.—12,324, A. Gibson, Feed Mechanism for Saw-mills.—12,325, W. Yelland, jun., Sash-fasteners.—12,329, A. Boult, Door-knob Attachments.—12,330, W. De Morgan, Construction of Walls or other Brick Structures.

Aug. 28.—12,350, J. Elwell, Portable Roofs for Temporary Buildings, &c.—12,397, W. Thompson, Sewer-gas Excluders.—12,408, J. Rashleigh, Insertion of Nails or Screws into Brickwork, Concrete, &c.

Aug. 29.—12,415, J. Porter and J. Wright, Fastenings for Doors and Windows.—12,460, T. de Cohn, Fastening or Securing Window-sashes.

Aug. 30.—12,470, G. Falconar, Framing Sash-windows, Doors, or Shutters.—12,493, J. and J. Leber, Mechanism for Checking the Time Worked by Employés in Factories, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

8,347, F. Lebacq, Composition for removing Old Paint.—9,620, E. Hodder and E. Cooke, Nails.—10,343, J. Crosthwaite, Construction of Chimney-pieces, Mantelpieces, &c.—10,578, A. Dunderdale, Collapsible or Folding Shutters, Gates, Balconies, &c.—10,586, A. McLean, Blocks or Slabs for Paving, &c.—10,669, G. Herdman, Preparation of Asphalte for Buildings, Bridges, Pavements, &c.—10,706, G. Evans, Construction of Window-frames and Hanging the Sashes.—10,757, F. Wendling, Paint for Stones, Plaster, &c.—10,824, C. Torkington, Preventing the Shaking of Window-sashes.—10,979, T. Thorp, Water-meter and Waste Preventer.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

14,630, W. Ihne, Ladders.—14,639, H. Alexander, Ventilator for Shafts, Pipes, Roofs, &c.—14,734, S. Carnaby, Apparatus for Turning, Opening, or Closing Ventilators, Balanced Windows, Venetian-binds, &c.—15,157, D. Greig and Others, Tip Waggons.—7,845, A. Boult, Sawing Machinery.—10,527, A. Boult, Machines for Lifting and Delivering Bricks, &c.—10,614, J. Howorth, Self-acting Propellor Ventilators.—11,089, G. Long, Fence-posts, &c.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

AUGUST 28.

By F. PIGGOTT.

Esher—Ground-rents of £81, reversion in 71 years	£2,285

By H. RUTLEY.

Kentish Town—11, Leighton-crescent, 52 years, ground-rent £10 10s.	450
Haverstock Hill—36, Queen's-crescent, 61 years, ground-rent £8	330

By H. N. NEWTON & Co.

Soho—50, Berwick-street, freehold	1,710
Camden Town—95, Arlington-road, 49 years, ground-rent £4	510

By HUMPHREYS, SKITT, & Co.

Greenwich—40 and 42, London-street, freehold	1,630
13, The Circus, freehold	760
Deptford—68 and 69, Charles-street, freehold	235

AUGUST 29.

By G. NEWMAN.

St. John's Wood—27, Marlborough Hill, 49 years, ground-rent 15*l.*	1,650
Commercial-road, E.—Ground-rent of £8, reversion in fourteen years	275

By WALFORD & WILSHIN.

Deptford—9 to 23 odd, Chipley-street, 72 years, ground-rent £38	1,200
25 to 31 odd, Chipley-street, 72 years, ground-rent £19	600

By D. J. CHATTELL.

Orpington, Kent—The freehold residence, "Montacute," and 6a. 2r. 3p.	1,950

By ORGILL, SWANN, & ORGILL.

Rotherhithe—Ground-rent of £52, reversion in 76 years	870
Rotherhithe, Prospect-place—Freehold stable and yard	200
Thornton Heath, Parchmore-road—Three plots of freehold land	60
New Cross-road—Ground-rent of £7, reversion in 57 years	160

By HOBSON, RICHARDS, & Co.

Fulham-road—No. 527, term 55 years, ground-rent £10	285

AUGUST 30.

By MURRELL & SCORELL.

The reversion to £4,304. 2s. 11d. in New Consols and Cash, life aged 78 years	3,020

By NEWBERRY & Co.

Lewisham—53, Court-hill-road, freehold	320

By GRAVES & SON.

Bayswater—15, Cornwall-road, 71 years, ground-rent £9	£520
22, Colville-mews, 62 years, ground-rent £4	120

By KING & CHASEMORE.

Wisborough Green, Sussex—"Old House Farm," 71a. 2r. 2p., freehold	1,700
Freehold meadow land, 6 acres	250

By E. STIMSON.

Caterham, near — Church-road, freehold land, 3a. 0r. 32p.	900
Walworth—105, 107, 117, and 119, Beresford-street, 15 years, ground-rent £12	575
Brixton, Canterbury-road — Ground-rent of £50, term 58 years	1,080
Canterbury-yard—A block of stabling, 58 years, no ground-rent	350
Lambeth—1, Wootton-street, 25 years, ground-rent £10	150
Walworth—49, Elsted-street, 21 years, ground-rent £4	100
Battersea—46, Wye-street, freehold	245
Ground-rent of £8, reversion in 83 years	170
Ground-rent of £10, reversion in 83 years	215

By PROTHEROE & MORRIS.

Kingston—The Kingston Nursery, 1a. 2r. 31p., freehold	4,000
13, Thames-street, freehold	3,900

By WILKINSON & SON (at Brighton).

Brighton—74, North-street, copyhold	2,460
1, Rose-hill, freehold	720

AUGUST 31.

By E. HOLSWORTH.

Haggerston—7, Gloucester-street North, freehold	550
8, Gloucester-street North, 52 years, ground-rent £4. 10s.	155

Miscellanea.

Sale of Building Sites at Lowestoft.—Last week Mr. A. G. Notley offered for sale at Lowestoft sixty-four freehold building sites, situated on the Kirtley Cliff Estate, commanding extensive views of the German Ocean. The sites were described as occupying a high and bracing situation, and as being within ten minutes' walk of the Lowestoft station, harbour, and pier. It was stated that the roads and drains on the estate had been substantially made up. The auctioneer also submitted fifteen plots adjoining the above estate, and abutting upon Hervey-street, Lowestoft. With reference to the plots on the Kirtley Cliff Estate, it was stipulated that the lowest sum to be expended in the erection of houses on any part of the estate should be 400*l.*, whilst as regards sixteen of the plots facing the sea, having frontages of 50 ft. and depths varying from 140 ft. to 209 ft., not less than 1,250*l.* was to be expended on each. All the plots submitted contained unusually large areas, the smallest having frontages of 25 ft. and depths of 100 ft. The sale took place in a marquee erected on the estate, when several of the plots were sold, the prices realised representing from 5 guineas to 7 guineas per foot frontage, or from 125*l.* each for the smaller plots to 350*l.* for those plots facing the sea.

National Registration of Plumbers.—On Aug. 18th, in Gordon College, Aberdeen, Mr. Sheriff Brown presented the diplomas earned by members in the district of the Plumbers' Company. Dr. Matthew Hay presided. According to a statement by the Secretary, 3,000 plumbers have already been enrolled by the Plumbers' Company, and seventy-nine of them belong to Aberdeen. Dr. Matthew Hay said that almost the majority of plumbers in Aberdeen and district had now become registered, and the number included most of the best workmen.——The Mayor of Stockton has fixed Friday next, the 14th inst., for a public meeting to be held in the Town Hall, for the appointment of local representatives to act on the district council lately formed in Newcastle.——Mr. J. Barkeley Smith (chairman of the Health Committee, Liverpool) has fixed the same day for the first meeting of the district council formed for applying the registration system in West Lancashire and North Wales.

Appointment of Borough Surveyor for Sheffield.—A special meeting of the Highway Committee was held last week, Ald. Hunter presiding, to select a gentleman for recommendation to the Council as Borough Surveyor of Sheffield. Out of 150 applicants for the post, the Committee selected six candidates, who were requested to attend the meeting. All the six gentlemen attended, namely, Mr. J. W. Brown, Borough Engineer and Surveyor, West Hartlepool; Mr. Joshua Cartwright, Borough Engineer, Bury, Lancashire; Mr. R. S. Dugdale, Borough Surveyor, Huddersfield; Mr. J. T. Eayrs, Borough Surveyor, West Bromwich; Mr. Thomas Longdin, Borough Surveyor, Warrington; and Mr. Charles Froggat Wike, C.E., Assistant Borough Surveyor, Leicester. After a long discussion the committee agreed to recommend Mr. C. F. Wike, C.E., for appointment. The salary is 800*l.* a year.

New Railway and Station Works at Greenwich.—On the first of next month the London, Chatham, and Dover Company will open their Greenwich extension line, which has been in course of construction during the last two years. Hitherto the Company have had no direct communication with Greenwich, their nearest station being at Blackheath Hill, which is upwards of a mile from Greenwich. The new railway is a continuation of the Company's extension from Nunhead to Blackheath Hill, which was opened some five or six years since. It commences by a junction with the Blackheath Hill station, and thence proceeding in a north-easterly direction, has its terminus conveniently situated near the centre of the town of Greenwich in Stockwell-street, near London-road, one of the principal thoroughfares in the town, being in the immediate vicinity of Greenwich Park. Although the line is scarcely three-quarters of a mile in length, it has involved a heavy outlay, a large amount of valuable property having had to be purchased in some of the best parts of the district. The line, which from its commencement to its terminus passes through a cutting about 25 ft. in depth, intersects no fewer than eight streets, across all of which bridges have had to be built. The retaining walls on each side of the line have throughout been faced with concrete. A commodious station has been built at the Greenwich terminus. The opening of the line will give the Company and the town of Greenwich several advantages. On the one hand Greenwich will be placed in direct communication with the Crystal Palace, *viâ* Lewisham-road, Nunhead, Honor Oak, and Lordship-lane, whilst the Company's Metropolitan Extension Line westward will give access to Victoria and the West-end, and also to the City at Ludgate-hill. Mr. A. Barker, the Company's Resident Engineer, has superintended the construction of the line, Messrs. Lucas & Aird having carried out the works.

The English Iron Trade.—The English iron market is continually growing stronger, while its activity is increasing, and values of nearly all descriptions of products are going up. This tendency cannot be attributed to speculation, and must be assigned to the expansion of trade making itself felt both in the home and export departments. Pig-iron has been most actively dealt in during the week, and we have witnessed the singular phenomenon of the Scotch warrant market having been led in its upward course rather than leading other markets, this fact being due to an improved trade outlook and a decrease of stocks. Scotch makers' iron has risen from 6d. to 1s. 6d. per ton; Cleveland iron is from 6d. to 1s. higher in value; the district brands sold in Lancashire have stiffened to an equal extent, while hematite iron is also quoted 1s. a ton more. Old material is participating in the general advance. Manufactured iron continues quite active, with an almost uniform advance of 2s. 6d. per ton. Tin-plates are not quotably higher, but they are enjoying an upward tendency. Steel is in fairly active, and for some descriptions in active, demand. Steel ship-plates, like iron-plates, cannot be delivered fast enough, and have advanced 5s. a ton in the North of England and Scotland, as well as on the west coast. There has been a rise in freights this week, and this has imparted a further stimulus to shipbuilding. As regards engineering, it will be sufficient to state that the trade is fairly engaged, while there is a steady improvement in prices.—*Iron.*

London and Middlesex Archæological Society.—We are informed that Mr. Joshua W. Butterworth, F.S.A., Vice-President of the London and Middlesex Archæological Society, proposes to commemorate the visit of the Society to Edmonton Church, on July 26 last, by the erection of a mural monument in the church to the memory of Charles Lamb, the essayist, and also to the memory of William Cowper, the poet. Mr. James Forsyth, sculptor, of Finchley-road, has been commissioned to execute the work from a design by Mr. Thomas Milbourn, architect, the Honorary Secretary of the Society.

Bombay Municipal Buildings.—We are informed that Mr. F. W. Stevens, F.R.I.B.A., has been appointed to design and carry out the new Municipal Buildings, Bombay. Mr. Stevens has just completed the Great Indian Peninsular Railway Victoria Terminal Buildings, the most extensive modern architectural work yet erected in India. The Municipal Buildings will be erected immediately opposite the Victoria Terminal Buildings.

Sanitary Appliances.—We have received from Messrs. John Bolding & Sons, of South Molton-street, a new and very complete catalogue of plumbers', engineers', and gas-fitters' brasswork, water-closets, sanitary earthenware, gullies, air-chambers, and drain disconnectors. From among a few items it is only possible to single out a few for special mention; but deserving of particular commendation is Messrs. Bolding's "Kenon" pedestal closet, in one piece of earthenware,—one of the best closets of the kind. Its form, aided by the depth of water in the basin, is such as to enable it to be easily kept in a thoroughly sanitary condition. It can be made with self-acting seat or otherwise. One of the most useful improvements in this direction that we have seen for a long time is Bolding's "Balance" closet-seat, which is self-rising, but gradual in action. Bolding's "Tranquil" water-waste-preventing cistern embodies an improvement of much importance. It is emptied by syphon action, but is noiseless, being fitted with a small pipe to the outlet of the supply valve, and a float valve on the syphon, which effectually prevent the disagreeable sucking noise caused during the emptying of the ordinary flushing-cisterns. Messrs. Bolding's excellent "Simplex" and other valve closets, lavatories, gullies, grease-traps, and other appliances too numerous to mention are all to be found figured in this very useful and instructive catalogue. One item among the brasswork we may mention, and that is the "School Board Lavatory Cock," which enables the caretaker of the school to ensure that the water is not wantonly wasted. The catalogue will be handy in every architect and builder's office.

Sewerage at Newmarket.—At a meeting of the Rural Sanitary Authority of Newmarket, on the 8th ultimo, plans, specification, and estimate were submitted by their Surveyor, Mr. W. Fraser, for the sewering of part of Exning. At the same meeting it was unanimously decided to increase the salary of Mr. Fraser to 150*l.* per annum.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Teak, E.I. ..... load	8 0 0	12 10 0
Sequoia, U.S. ..... foot cube	0 2 3	0 3 0
Birch, Canada ..... load	2 15 0	4 15 0
Fir, Dantsic, &c.	2 0 0	4 0 0
Oak ,, ...	2 0 0	4 10 0
Canada	4 0 0	6 10 0
Pine, Canada red	2 10 0	3 10 0
,, yellow	2 10 0	4 0 0

TIMBER (*continued*).	£. s. d.	£. s. d.
Lath, Dantsic ..... fathom	3 10 0	5 0 0
St. Petersburg	5 0 0	6 0 0
Wainscot, Odessa, crown	2 10 0	3 0 0
Deals, Finland, 2nd and 1st ...std. 100	8 0 0	9 10 0
,, 4th and 3rd	6 10 0	7 10 0
Riga	6 0 0	7 10 0
St. Petersburg, 1st yellow	9 10 0	15 0 0
,, 2nd ,, ...	8 0 0	9 0 0
,, white	7 10 0	10 0 0
Swedish	7 10 0	16 10 0
White Sea	8 10 0	17 10 0
Canada, Pine, 1st	15 0 0	24 0 0
,, ,, 2nd	9 10 0	15 10 0
,, ,, 3rd, &c.	7 10 0	9 10 0
,, Spruce, 1st	8 10 0	9 10 0
,, 3rd and 2nd	6 0 0	7 10 0
New Brunswick, &c.	6 10 0	7 5 0
Battens, all kinds	4 10 0	11 0 0
Flooring Boards, sq., 1 in., prepared, First	0 10 6	0 13 6
Second	0 7 0	0 10 3
Other qualities	0 4 6	0 6 9
Cedar, Cuba ..... foot	0 0 3½	0 0 3¾
Honduras, &c.	0 0 3½	0 0 3¾
Australian	0 0 2	0 0 3
Mahogany, Cuba	0 0 4½	0 0 5½
St. Domingo, cargo average	0 0 4½	0 0 5½
Mexican ,, ...	0 0 4	0 0 4½
Tobasco ,, ...	0 0 4½	0 0 5½
Honduras ,, ...	0 0 4½	0 0 5½
Box, Turkey ..... ton	5 0 0	12 0 0
Walnut, Italian ..... foot	0 0 4½	0 0 6

METALS.

IRON—Bar, Welsh, in London ...ton	4 17 6	5 0 0
,, ,, at works in Wales ...	4 7 6	4 10 0
,, Staffordshire, in London ...	5 5 0	6 15 0
COPPER—		
British, cake and ingot ..... ton	77 10 0	78 10 0
Best selected	79 0 0	80 0 0
Sheets, strong	85 0 0	0 0 0
Chili, bars	95 10 0	0 0 0
LEAD—		
Pig, Spanish ..... ton	13 7 6	13 0 0
English, common brands	13 10 0	13 12 6
Sheet, English	14 12 6	14 17 6
SPELTER—		
Silesian, special ..... ton	18 0 0	0 0 0
Ordinary brands	17 15 0	0 0 0
TIN—		
Straits ..... ton	97 10 0	0 0 0
Australian	97 10 0	0 0 0
English Ingots	102 0 0	0 0 0
ZINC—		
English sheet ..... ton	19 10 0	20 10 0

OILS.

Linseed ..... ton	18 5 0	18 10 0
Cocoanut, Cochin	24 10 0	26 10 0
Ceylon	23 0 0	23 10 0
Palm, Lagos	21 0 0	0 0 0
Rapeseed, English pale	26 5 0	26 10 0
,, brown	25 0 0	25 5 0
Cottonseed, refined	20 15 0	21 0 0
Tallow and Oleine	25 0 0	45 0 0
Lubricating, U.S.	4 0 0	6 0 0
,, refined	7 0 0	12 0 0
TURPENTINE—		
American, in casks ..... cwt.	1 8 9	0 0 0
TAR—		
Stockholm ..... barrel	0 16 0	0 16 6
Archangel	0 10 0	0 10 6

CONTRACTS.

Epitome of Advertisements in this Number.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Repairing Carriageways	St. Luke's (Midx) Ves.	*Official*	Sept. 11th	ii.
Broken Granite	East Ham Local Board	W. H. Savage	do.	ii.
Road-Making and Paving Works	Hammersmith Vestry...	H. Mair	Sept. 12th	ii.
Blue Guernsey Granite Spalls	West Ham Union	*Official*	do.	ii.
Paving Works	Vestry of St. Giles, Camberwell	do.	Sept. 17th	x.
Repairs, Alterations, &c., to Town-hall	St. Leonard, Shoreditch, Vestry	do.	Sept. 18th	ix.
Two Residences, Finchley	C. A. Mackness, Esq....	E. W. Brooking	Sept. 19th	ix.
Roadmaking and Paving Works	Fulham Vestry	J. P. Norrington	do.	ix.
Stables, House, and Office, &c.	do.	*Official*	do.	ix.
Smiths', Engineers', and Ironmongers' Work	Greenwich Brd. of Wrks	do.	do.	x.
Carbolic Powder and Liquid	do.	do.	do.	x.
Enlargement—Wolverhampton Post Office ...	Com. of H.M. Works...	do.	Sept. 20th	ii.
Broken Granite and Flints	St. Matthew's, Bethnal Green, Vestry	F. W. Barratt	do.	ix.
Sewerage Works	Edmonton Local Board	J. E. Eachus	Sept. 25th	x.
Road-Making Works	Tottenham Local Board	J. E. Worth	do.	x.
Extension of Sewer, &c.	Brighton Sewers Board	P. C. Lockwood	Oct. 1st	x.
Store Shed, Finsbury Park	Met. Board of Works...	*Official*	Oct. 2nd	ii.
Cleaning out Lake, Battersea Park	do.	do.	do.	ii.
Removal of Temporary Iron Buildings	School Brd. for London	do.	Not stated...	ix.
Extension of Warming Works	do.	do.	do.	ix.
Enlargement, &c., of Board Schools	do.	do.	do.	ix.
Detached Houses, Tunbridge Wells	.....	W. B. Hughes	do.	ii.

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays.*]

BIRMINGHAM.—For providing and fixing hot-water heating-apparatus for residence for Mr. W. G. Scott, Augustus-road, Edgbaston. Mr. J. A. Chatwin, architect, Temple-street, Birmingham:—

Henry Hope, Birmingham (accepted)	£102 0 0

[Brickwork and ornamental coil-cases extra.]

CRAVEN ARMS (Salop).—For new dwelling-house, &c., for Mr. C. H. Kynaston, Wem. Mr. W. T. Mathews, architect, Shrewsbury:—

J. Williams, Knighton	£615 0 0
Weale & Co., Ludlow	515 0 0
C. T. Smith, Broseley	479 0 0
H. Barker, Onibury	433 8 0

ENFIELD.—For the erection of residence, Turkey-street, Enfield, for Mr. H. C. B. Bowles. Mr. C. S. Robertson, architect, Finsbury-pavement:—

Linsell, Tottenham	£1,300 0 0
L. & W. D. Patman, Enfield	1,194 0 0
John Brooks (late Brooks & Meader), Enfield	1,159 0 0

KENILWORTH.—For providing and fixing a hot-water heating-apparatus at St. John's Church, Kenilworth:—

Henry Hope, Birmingham (accepted)	£198 0 0

LONDON.—For shop-front and alterations to No. 11, Buckingham Palace-road, S.W. Mr. A. W. Saville, architect, 99, Strand:—

Drew & Cadman	£291 0 0
Ward & Lamble	238 0 0
Spencer & Co.	224 0 0
S. Yardley & Sons (accepted)	224 0 0

HACKNEY.—For painting the several blocks of the Hackney Union and Infirmary. Mr. W. Barnett, Winchester House, Old Broad-street, architect:—

Major	£1,100	0	0 !
Rowley	1,016	0	0
Smith	891	0	0
Savage	890	0	0
Lane	829	0	0
White	810	0	0
Gilbey	766	0	0
Wicks	700	0	0
Wright	694	0	0
Buckle	689	0	0
Richards	648	0	0
Weller	639	0	0
Henderson	633	0	0
Wyche	626	0	0
Porter	613	0	0
Mackey	612	0	0
Sherwood	608	0	0
Wilmott	607	0	0
Chillingworth	606	0	0
Howard	601	0	0
Booth	581	0	0
Nye	574	0	0
G. Barker	570	0	0
Vigor	557	0	0
Shore	557	0	0
Allard	516	0	0
Edwards	512	0	0
Fullyer	479	0	0
Ovenden	454	0	0
Wright	420	0	0
Mullett (accepted)	407	0	0 !

LONDON.—For alterations and additions at the South-Eastern Ambulance Station, New Cross-road, for the Metropolitan Asylums Board. Mr. Thos. Wm. Aldwinckle, architect, 2, East India-avenue, Leadenhall-street, E.C. Quantities supplied:—

W. & B. Bardell	£7,582	0	0 !
Staines & Son	7,384	0	0
Brown, Son, & Co.	6,990	0	0
T. Simpson	6,900	0	0
W. Brass & Son	6,799	0	0
Wall Bros.	6,747	0	0
Ward, Clarke, & Co.	6,579	0	0
J. W. Sawyer	6,446	0	0
W. Johnson (accepted)	6,320	0	0
G. Stephenson	6,200	0	0
J. O. Richardson (withdrawn)	4,940	0	0 !

LONDON.—For the works required in alterations and additions to Nos. 107 and 108, Cheyne Walk, Chelsea, for Mr. F. Cole:—

E. Woodhouse, Woodford	£1,376	0	0 !
H. Hollingsworth, Peckham	1,280	0	0
J. Poulton, Euston-road	1,160	0	0
F. J. Wicks, Willesden Park	1,125	0	0
Newton & Co., Clapham Common	1,087	0	0
W. J. Richardson, Lavender Hill	1,040	0	0
A. Brickell, West Kensington	993	0	0
R. & H. Bryon, 259, Fulham-road	950	0	0
A. Cole, Kilburn	870	0	0
C. Beach, Brondesbury	862	0	0
A. R. Flew & Co., West Kensington Gardens	820	0	0
R. Cox, Battersea	795	0	0
Child & Co., Pond-place, Chelsea	788	0	0
F. Blandford, Highbury	595	0	0 !

LONDON.—For new roof and sundry alterations at "Dorset Works," East-road, City-road, for Messrs. Dottridge Bros. Mr. A. G. Collins, architect, 30, Finsbury-pavement:—

T. Nixon	£337	0	0
H. J. Williams, 18, Bermondsey-street, S.E. (accepted)	317	10	0

LONDON.—For painting and decorating work in dining-room, at 80, Cornwall-gardens, S.W., for Mr. Frederick Haworth:—

Godfrey Giles & Co., 19, Old Cavendish-street, W. (accepted)	£121	0	0

LONDON.—For taking down and rebuilding three shops and screen factory, adjoining the Grand Theatre, Islington, for Mr. C. Wilmot. Mr. C. Bell, architect, 3, Salters' Hall-court, Cannon-street, E.C. Quantities by Mr. W. Heelis, 26, Budge-row, Cannon-street, E.C.:—

Paine Bros.	£3,500	0	0
Sharp	2,970	0	0
Veale*	2,949	0	0

* Accepted subjected to a reduction. [Other names and amounts as per full list given last week.]

LONDON.—For shop-front and interior fittings at No. 163, High-street, Stoke Newington, N., for Mr. A. Amsden:—

S. Yardley & Sons (accepted)	£270	0	0

LONDON.—For pewterer's work at the "York Hotel," Waterloo-road:—

Edwards	£189	10	0
Watts	186	7	0
Pringle	184	0	0
Sanders	170	0	0
Helling	160	0	0
Buckley & Beach (accepted)	154	0	0

NEW ROMNEY (Kent).—For additions to National Schools, New Romney, Kent. Mr. J. Downsborough, architect, Bexhill-on-Sea:—

W. Tourney, Hythe	£415	17	6
C. Hughes, Bexhill	385	0	0
Potter, Standing, & Co., New Romney	325	8	0
W. J. Haisell, Lydd	285	0	0
A. Hutchinson	279	0	0
Pearson's Executors, New Romney *	271	0	0
J. E. Hughes, Ashford	267	9	0
Samuel Woodley, Littlestone	254	0	0

* Accepted.

WANDSWORTH.—For repairs, painting, and sanitary works to the "Old Block Wards," at the Infirmary, St. John's Hill, for the Guardians of the Poor of the Wandsworth and Clapham Union. Mr. T. W. Aldwinckle, architect, 2, East India-avenue, Leadenhall-street, E.C.:—

W. Hammond	£1,300	0	0 !
J. Mills	1,190	0	0
W. & J. Bardell	1,111	0	0
M. Marsland	1,089	0	0
J. Hole	1,086	0	0
Turtle & Appleton	1,075	0	0
W. Johnson (accepted)	1,065	0	0
J. Edmunds	994	0	0
G. Marsh (withdrawn)	679	0	0 !

Shop, &c., High-street, Islington.—Messrs. Paine Bros., of Vartry-road, Stamford-hill, write to say that their tender for the erection of shop and premises for Mrs. Bland, in High-street, Islington, was 1,900*l.*, not 1,990*l.*, as printed. The list was printed as we received it.

TO CORRESPONDENTS.

R. F. C.—J. N. (we cannot return to the subject now).—C. S.—W. B. D.—C. F. M.—J. M.—W. B. S. (letter not suitable for our columns).—W. H. T.—E. W. M.—B. & B. (one list inserted: the others are below our mark).—C. I. & Co. (your MS. is illegible).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, "THE BUILDER, LONDON."

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DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY, and for the Front Page by the same Hour on WEDNESDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY mornings.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office*, 46, Catherine-street, Covent Garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage

AN EDITION Printed on THIN PAPER, for FOREIGN CIRCULATION, is issued every week.

Now ready.

READING CASES, { NINEPENCE EACH. By post (carefully packed), 1s.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

SUBSCRIBERS in LONDON and the SUBURBS, by prepaying at the Publishing Office, 19s. per annum (or 4s. 9d. per quarter), can ensure receiving "The Builder" by *Friday Morning's post*.

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CORSHAM DOWN. | FARLEIGH DOWN.

BOX GROUND. | COMBE DOWN.
WESTWOOD GROUND. | STOKE GROUND.

THE BATH STONE FIRMS, Limited.
HEAD OFFICES: BATH.

DOULTING FREESTONE.

THE CHELYNCH STONE. The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.

THE BRAMBLEDITCH STONE. Is of the same crystalline nature as the Chelynch Stone, but finer in texture, and more suitable for fine moulded work.

Prices, and every information given, on application to CHARLES TRASK & SONS, Doulting, Shepton Mallet.

London Agent—Mr. E. A. WILLIAMS, 16, Craven-street, Strand, W.C. [ADVT.

HAM HILL STONE.

Greater facilities have been provided for working these quarries, and the stone can be supplied in large quantities at short notice.

Prices, and every information given, on application to the HAM HILL STONE CO., Norton, Stoke-under-Ham, Somerset.

London Agent—Mr. E. A. WILLIAMS, 16, Craven-street, Strand, W.C. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, graneries, tun-rooms, and terraces. [ADVT.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.,
Office:
No. 90, Cannon-street, E.C. [ADVT.

SPRAGUE & CO.,
PHOTOLITHOGRAPHERS,
22, Martin's-lane,
Cannon-street, E.C. [ADVT.

S. L. WILLIAMSON,
PEWTERER, LICENSED VICTUALLERS' BAR FITTER, BEER ENGINE MAKER, BRASS FINISHER,
328, MILE END ROAD, LONDON, E.
Contractor to Her Majesty's Government.
Estimates given on application.

Garside's Noted Bedfordshire Coarse and Fine Silver Sand.—Is perfectly free from impurity, and the best and cheapest in the market. All qualities in stock, for every purpose required in the building trade, for filtration, or for nursery purposes. All pure grit!
Apply to
GEORGE GARSIDE, JUNR., F.R.H.S.,
Leighton Buzzard. [ADVT.

HOBBS, HART, & CO., Limited,

MAKERS TO HER MAJESTY BY SPECIAL APPOINTMENT.
The Bank of England and its Branches, including New Law Courts Branch, now building.

PATENT PROTECTOR AND LEVER LOCKS, for all Purposes.

STEEL SAFES, STRONG-ROOM & PARTY-WALL DOORS.

SELF-CLOSING DOORS, FOR THEATRES AND PUBLIC BUILDINGS,
As approved by the Metropolitan Board of Works (used in large numbers at Covent Garden Theatre).

IMPORTANT COMMUNICATION.—FIRE AT WHITELEY'S.

WILLIAM WHITELEY, Westbourne Grove,
London, Oct. 12th, 1887.

HOBBS, HART, & CO., LIMITED.

GENTLEMEN.—It affords me very much pleasure to express to you my satisfaction and admiration at the splendid fire-resisting powers of your Strong-room doors and the Safes.

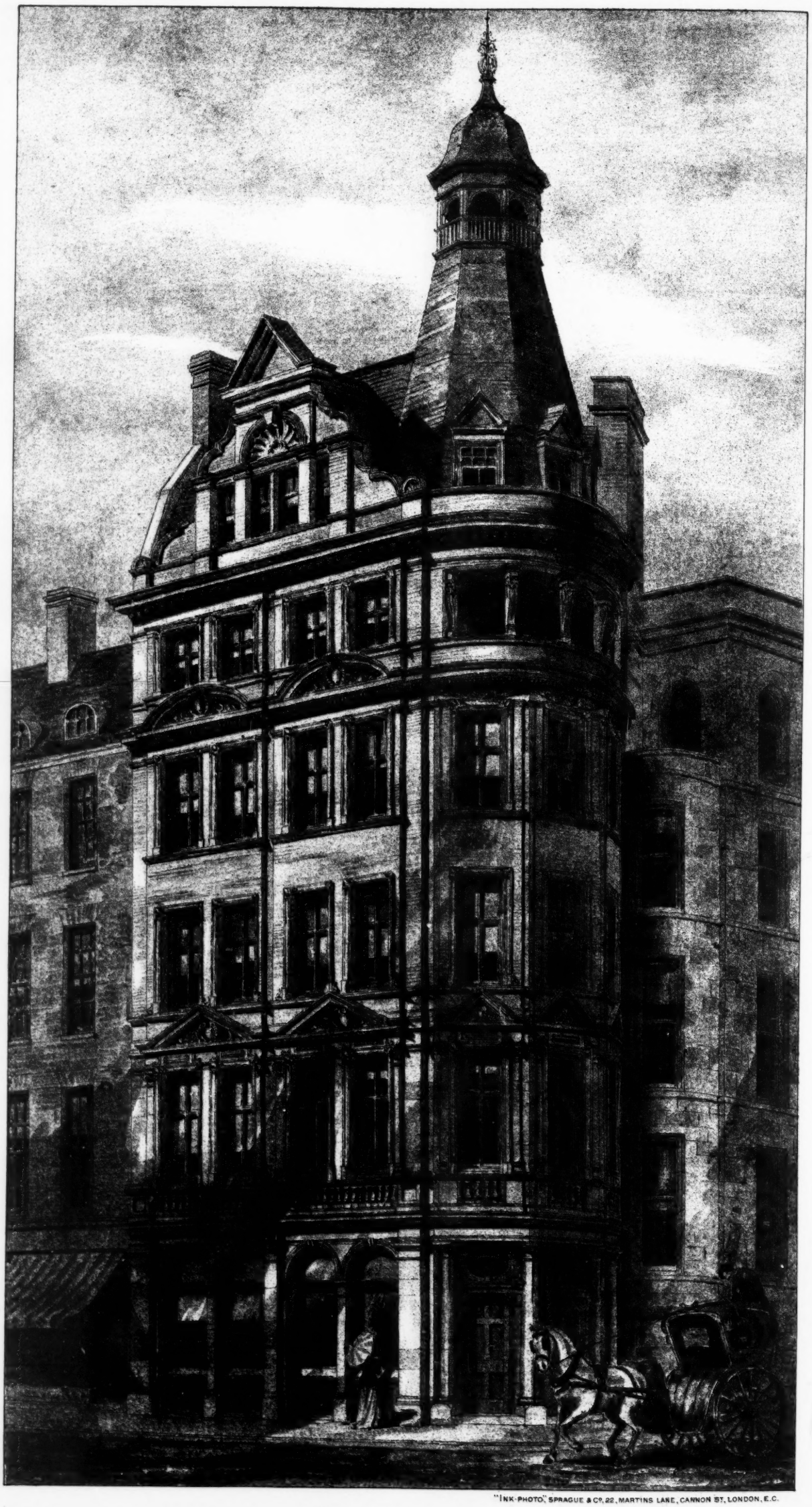
The recent fire at my establishment in my opinion subjected them to the greatest possible test, and through all, they proved invulnerable.

The contents of both Strong Rooms and Safes were entirely preserved, although the fire was of such intense destructive force.

You will be pleased to hear that it has been decided to adopt your Patent Clutch-rebated Doors for all the party-walls in the new buildings now in course of erection.—I am, Gentlemen, faithfully yours,

(*Signed*) WILLIAM WHITELEY.

Offices and Warehouse: 76, CHEAPSIDE, London; Manufactories, Wharncliffe Works, Arlington-street, London, N.



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CLEMENTS INN CHAMBERS.—Mr. F. Hemings, A.R.I.B.A., Architect.

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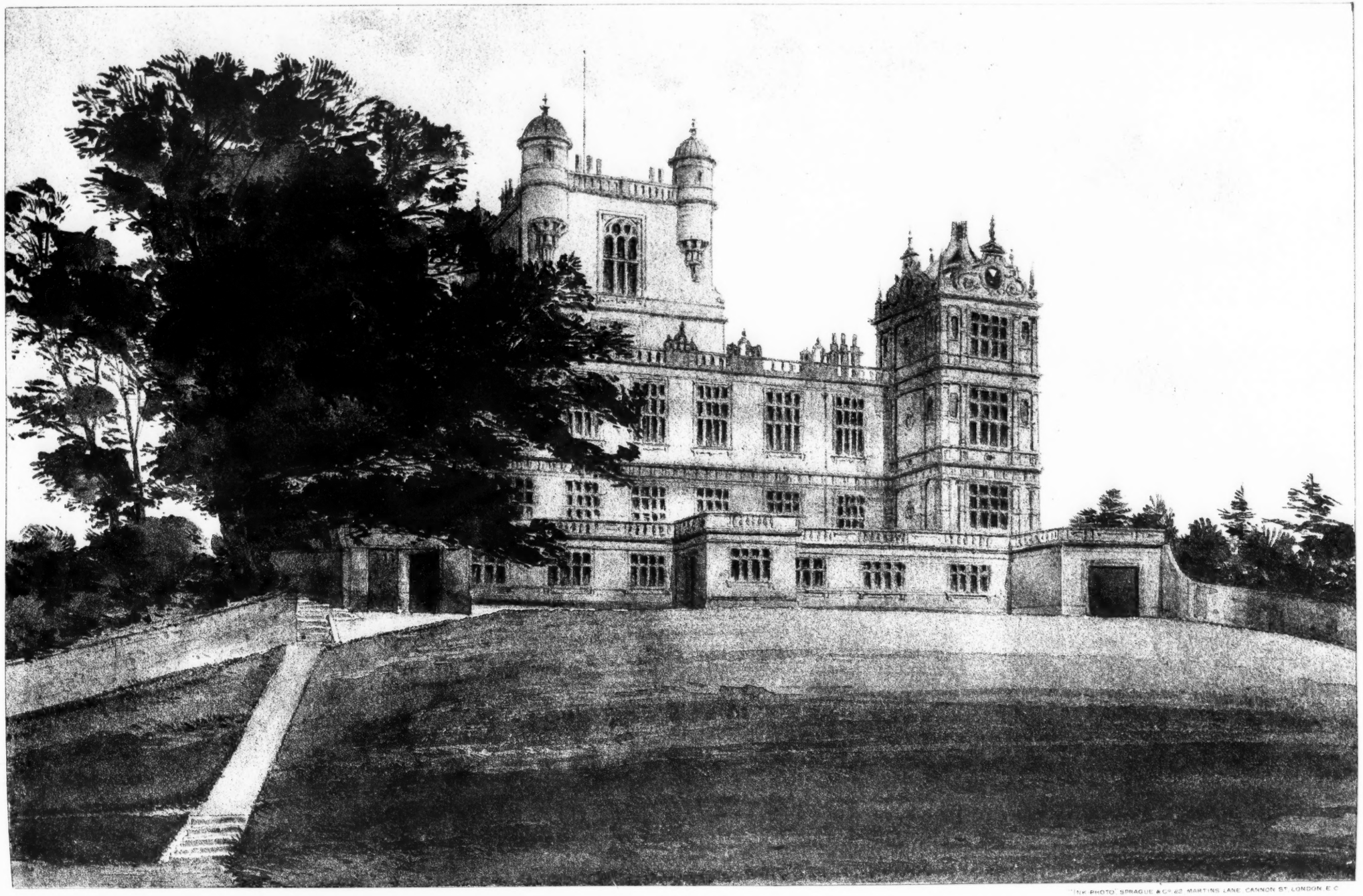
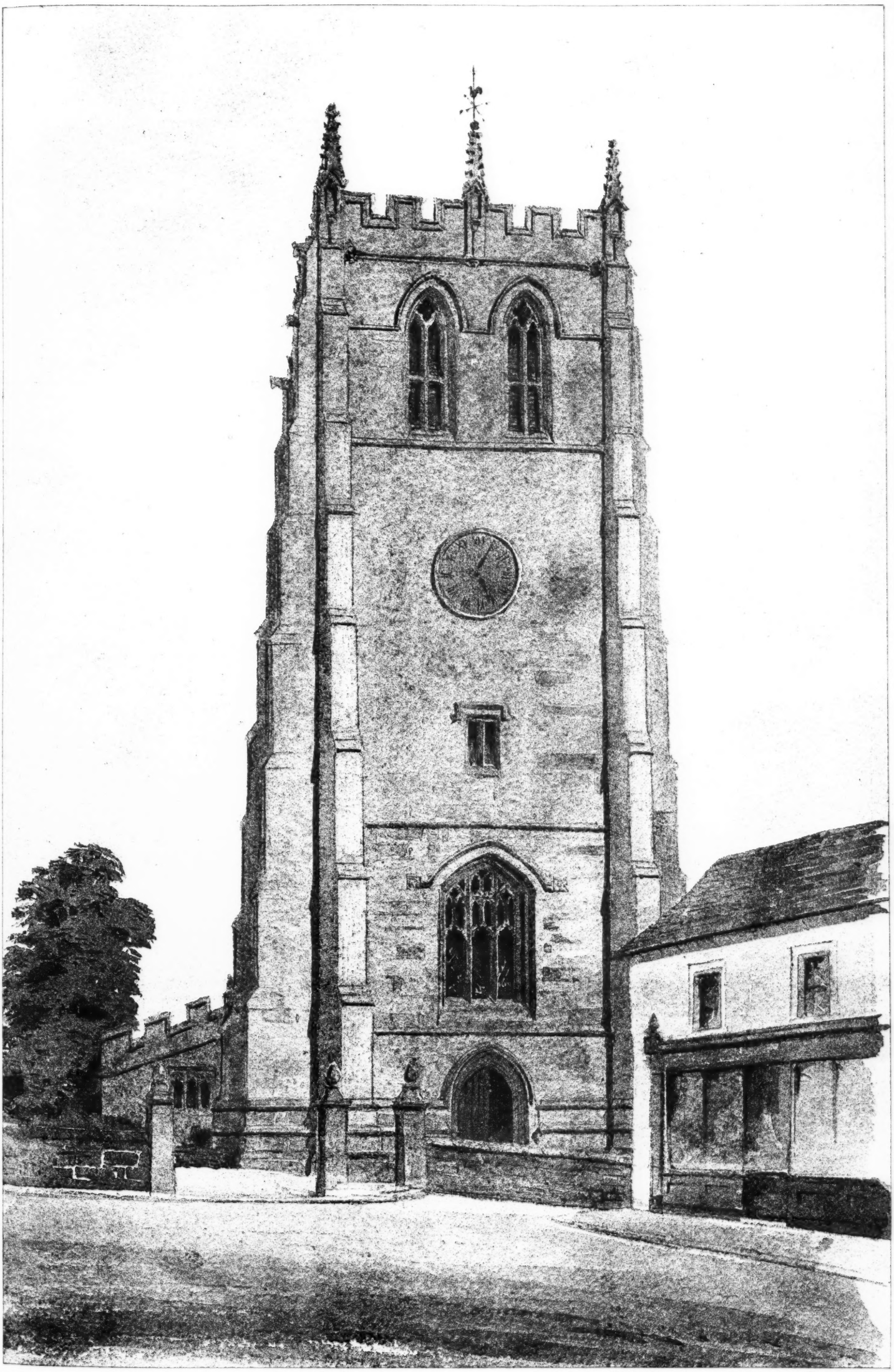
STATUE OF SHAKESPEARE, PARIS.—M. PAUL FOURNIER, SCULPTOR.



"INK PHOTO" SPRAGUE & Co. 62 MARTINS LANE CANNON ST LONDON E.C.

WOLLATON HALL FROM THE NORTH WEST.—From a Sketch by Mr. J. Johnson, A.R.I.B.A.



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YOULGREAVE CHURCH.—From a Sketch by Mr. J. Johnson, A.R.I.B.A.

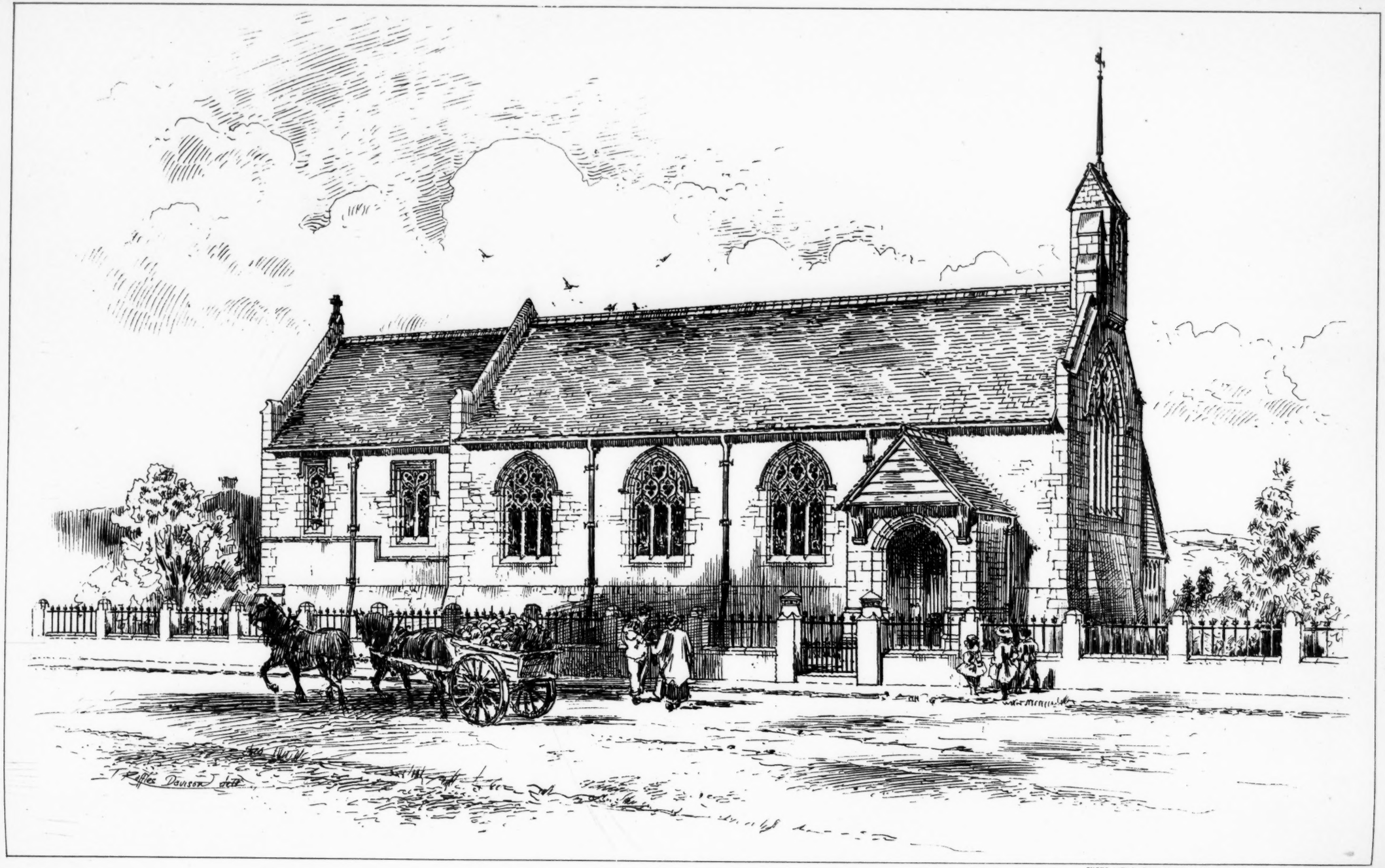
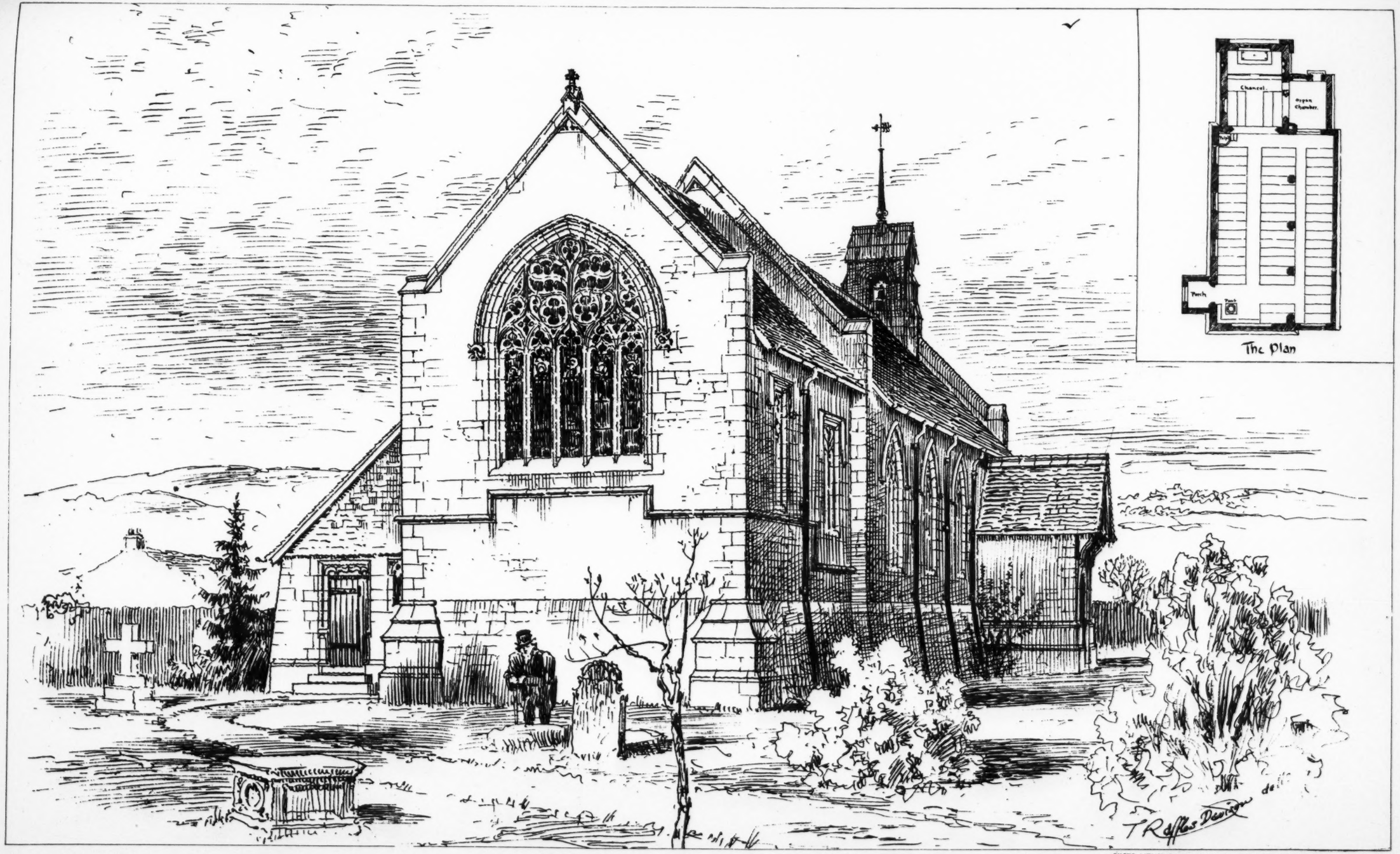


PHOTO-LITHO., SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

STONEFOLD CHURCH, LANCASHIRE.—Mr. Basil Champneys, Architect.
NORTH WEST VIEW.



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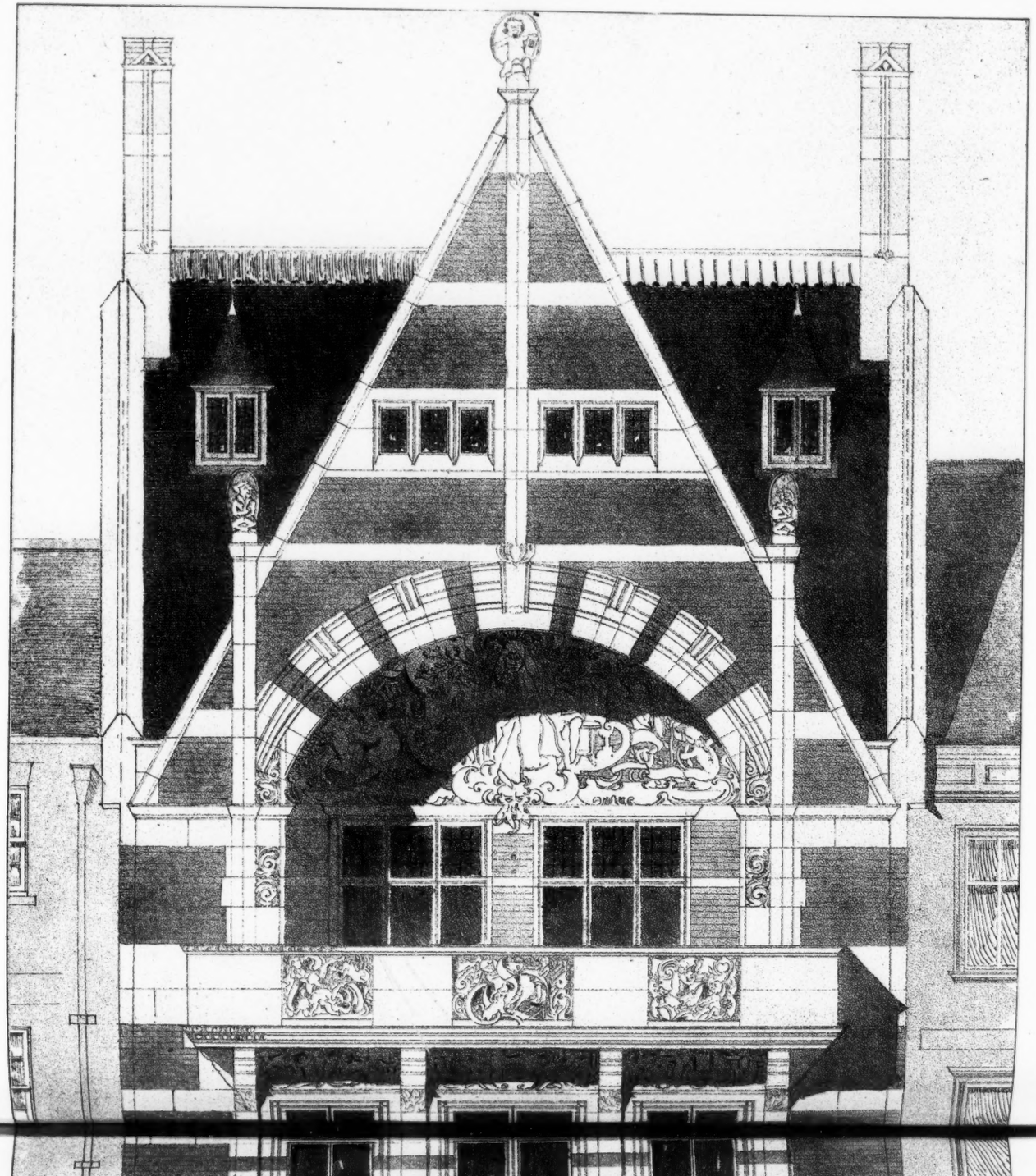
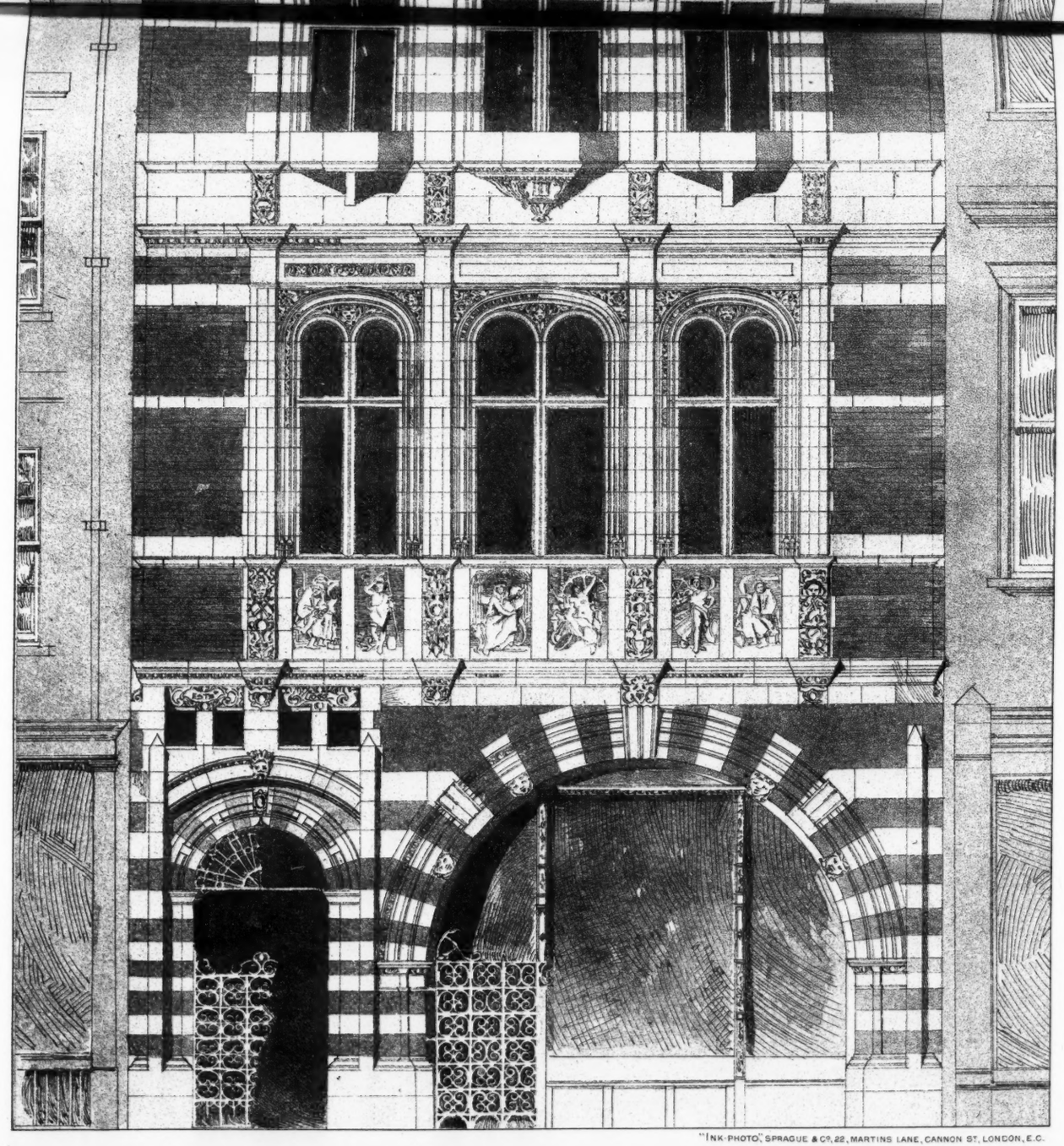
STONEFOLD CHURCH, LANCASHIRE.—Mr. Basil Champneys, Architect.

NORTH EAST VIEW.





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DESIGN FOR A LONDON STREET FRONT.—By Mr. C. E. Mallows.